

**IN-SITU CROP RESIDUE MANAGEMENT**  
**Key Outcome and Learning**



भारतीय  
ICAR

INDIAN COUNCIL OF AGRICULTURAL RESEARCH  
NEW DELHI

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IEC activities of Central Sector Scheme on “Promotion of Agricultural Mechanization for *In-situ* Management of Crop Residue in the States of Punjab, Haryana, Uttar Pradesh and NCT of Delhi” are funded by DAC&FW, New Delhi

## PROMOTION OF AGRICULTURAL MECHANIZATION FOR *IN-SITU* MANAGEMENT OF CROP RESIDUE IN THE STATE OF PUNJAB, HARYANA, UTTAR PRADESH AND NCT OF DELHI

North-Western Indian states of Punjab, Haryana and Western Uttar Pradesh are recognized as the heartland of Green Revolution and provide bulk of rice and wheat in the national food basket. Paddy is grown in about 4.2 million ha in Punjab and Haryana and farmers generally burn paddy straw in the field itself except for basmati rice. Cultivation of high yielding varieties of rice and wheat results in production of large quantities of crop residues in this region. Burning crop residue causes pollution problems in the atmosphere and huge nutritional loss and physical health deterioration to the soil. It is estimated that the burning of one tone of paddy straw releases 3 kg PM, 60 kg CO, 1460 kg CO<sub>2</sub>, 199 kg ash and 2 kg SO<sub>2</sub>. These gases affect human health due to degradation in air quality resulting in aggravation of many diseases. Since, time available between the rice harvesting and wheat sowing is very less, it is necessary to develop appropriate strategies for *in-situ* crop residue management to enable zero burning.

To address the problem of crop residue burning holistically, Ministry of Agriculture & Farmers' Welfare, Government of India initiated the Central Sector Scheme on "Promotion of agricultural mechanization for *in-situ* management of crop residue in the state of Punjab, Haryana, Uttar Pradesh and NCT of Delhi" popularly known as Crop Residue Management (CRM) scheme amounting Rs. 1152 Crores for 2018-19 and 2019-20. The objective of the scheme envisages promotion of agricultural mechanization for *in-situ* management of crop residue.

### EFFORTS BY INDIAN COUNCIL OF AGRICULTURAL RESEARCH (ICAR)

The Department of Agriculture, Cooperation & Farmers' Welfare (DAC&FW) sanctioned a project to Indian Council of Agricultural Research (ICAR) under this scheme with an outlay of Rs. 21.29 Crores for 2018-19. This project is being implemented by ICAR-ATARIs through 60 Krishi Vigyan Kendras (KVKs) of Punjab (22), Haryana (14), Delhi (1) and UP (23). KVKs executed the activities under Information, Education and Communication (IEC) component.

**The preparedness meet of KVKs:** The meet was for the proper implementation of the Central Sector Scheme. DG, ICAR highlighted the expectations of the Government while

addressing the issue of residue burning and Krishi Vigyan Kendras (KVKs) were to be the prime mover of the scheme. DDG (Agri. Ext.), ICAR informed about the preparedness that would be needed for the Information, Education and Communication (IEC) part of the scheme.

**Major recommendations made were:**

- Focus to be on specific villages and strategic locations
- KVKs to be strengthened to machine pool centres for facilitating farmers
- Demonstration and training action plans to be chalked out
- Extension literatures and other materials to be prepared at the earliest
- Social media to be extensively utilized for awareness generation
- Multi-benefits of Happy Seeder technology to be specifically highlighted during Harvest Field Days
- Convergence to be ensured at all the stages of scheme implementation
- Local artists, religious saints, media etc. to be integral part of the campaign



**The environment building for *in-situ* residue management:** KVKs have used different means to develop an environment conducive for *in-situ* management of crop residues and against their burning. Thus, catchy slogans and messages were placed as **wall paintings** at the prominent locations to attract people's attention. Bright color was used to paint messages with large font sizes to become readable from a distance. Walls of buildings near village streets, village entrance, highways, bus-stops, rain sheds, schools, *panchayats*, pump

houses etc. were painted with slogans to appeal to the eyes of passerby. Similarly, more than **10,000 posters, banners and hoardings** were deployed to urge to the value system and shake the conscience. The messages carried information regarding ill-effects of burning, technological options, prices of machines, subsidies under the Central scheme etc. Moreover, farmers' pledges of no burning with their photographs were placed strategically. Government buses were also pasted with posters to carry the message everywhere.



Wall paintings at prominent places in the villages

Local newspapers were flooded with the articles and columns (about 450) focusing residue management in laymen's language. Likewise, activities done by KVKs and efforts of the Government for shunning residue burning were highlighted through news. More than 500 advertisements of the scheme and KVK programs were published in the local newspapers. Nonetheless, electronic media like radio and television were effectively utilized for the purpose of environment building. Specific tunes, songs and jingles were recorded and played regularly on radio since paddy harvesting season till wheat sowing was over. More than **100 panel discussions and programs** were broadcasted on local **television channels, DD Kisan** and other private channels. Alongside, publicity materials like leaflets, folders and pamphlets were distributed among more than **4.5 Lakh stakeholders** to provide preliminary information about ill-effects of residue burning and provisions under the Central scheme.

Moreover, around **700 awareness programs** were conducted at village, block and district levels. Likewise, **75 kisan melas** in which around **2 lakh farmers** participated were



Sh. V.P. Singh Badnore, Hon'ble Governor of Punjab addressing farmers in Kisan Mela at KVK, Gurdaspur



organized to drive people's attention to the issue and to exhibit technological solutions to solve the issue.

**The alliance with the young minds:** School and college students were specifically targeted as the potential stakeholders to help their farmer parents, neighbors and villagers to come out of their comfort zone and adopt latest technologies for *in-situ* residue management. About 40,000 students of 250 schools and colleges were informed about the problem of

residue burning and the Central scheme and were asked to read more in newspapers and magazines to get necessary details and understanding of residue management issue. The main aim of connecting with students was to promote action on their part against the social evil of residue burning. Lectures were delivered to inform students and different competitions were organized to bring out their reflections in the forms of posters, slogans, essays etc. Moreover, it would surface their ideas about the problem and might give insight into innovative ways to change attitude of farmers.



**Awareness activities involving school children**

KVKs with the motivated young minds organized awareness rallies/*chetna pheries* in village to convey the message for *in-situ* residue management. Such rallies also involved distribution of literature on the topic of residue management among farmers and other stakeholders.

**Preachers and conservationists in the driver's seat:** Religious saints have been driving the Indian society for ages, specifically when the ill-diverted human mind needed to re-establish its relationship with the nature. Residue management is no exception, as these religious preachers have once again come forward to the rescue. Their ability to appeal to the human mind and direct the community towards social action has been phenomenal. Few KVKs handed over the steering wheel of residue management drive to religious leaders like Baba Sewa Singh, Baba Balbir Singh Seechewal and Baba Gurmeet Singh and results were astounding. They lead the campaign from the front and mobilized farmers and other stakeholders to spread the message. Verses of religious texts highlighting the necessity of co-existence between nature and mankind were time and again reiterated.



It helped people in introspecting themselves and giving a serious thought on the way human beings are affecting nature and its phenomenon.



**Padma Shri Baba Balbir Singh Seechewal:** Also known as the “Eco Baba”, environmentalist Baba Seechewal is known for his crusade against river pollution with Kali Bein river in Punjab during year 2000. He was also honored with nation's fourth highest civilian award “*Padmashri*” under Social Work category. Baba is also working for sensitizing farmers against burning residues. He has collaborated with KVK, Jalandhar in



**Padma Shri Baba Balbir Singh Seechewal participated in the Kisan Mela to appeal and motivate farmers for shunning stubble burning**

its awareness drive. During an awareness rally in Kapurthala, he covered around 50 villages with devotees, volunteers and KVK staff to popularize *in-situ* residue management practices. He invited youth to come forward and take lead in adopting new technologies and searching entrepreneurial avenues of self-employment through Custom Hiring Centres. Similarly, he presided as the Chief Guest of *Kisan Mela* organized at KVK, Jalandhar, where he talked about the bad effects of residue burning and appealed to the participating 3500 farmers to follow environment friendly practices.

**Padma Shri Baba Sewa Singh:** Social worker and environmentalist *Padma Shri* Baba Sewa Singh is known for his restoration and maintenance work of the historic *Gurudwaras* at Khadoor Sahib in Tarn Taran district of Punjab. Baba has also been in the fore front in advising environment friendly agriculture and residue burning free farming. He was the Chief Guest of *Kisan Mela* organized by KVK, Kapurthala for popularizing *in-situ* crop residue management. He interacted



**Padma Shri Baba Sewa Singh sharing his experiences with the farmers**

with the participating farmers and other stakeholder about the issue and guided to stay away from all the activities that pollute our environment. He inaugurated the exhibition on machines used for residue management and appealed farmers to follow scientifically proven technological solutions than opting for burning. He also urged everyone to treat soil as a living being and respect its ability to sustain human kind.

**Baba Gurmeet Singh:** Sant Baba Gurmeet Singh is a social worker who has dedicated his life for preaching values of Sikhism in the service of people. He regularly participated in KVK activities and shared his opinions on the matter. He has been the proponent of KVK in villages namely Khosa Pando, Khosa Kotla, Khosa Randhir, Khosa Jalal and Ghagra to bring down burning to almost zero. During the farmer-scientist interfaces, he recommended latest paddy residue management technologies to the farmers. He also stressed on youth to start Custom Hiring Centers. He asked farmers to swear by the *Gurbani* to never burn crop residues. Baba also partnered with the KVK to sensitize school students

about residue burning and its effective management. He stresses on collective efforts and actions for enabling youth to manage paddy straw scientifically.

**The proponent of mission 'zero burning':** Many proponent farmers of *in-situ* residue management have come forward to persuade fellow farmers. A 53 year old devotee Sikh, Sardar Gurbachan Singh is one such farmer, who is a resident of Buraj Deva Singh Wala village of Tarn Taran, Punjab near Pakistan border. S. Gurbachan Singh has close coordination with Krishi Vigyan Kendra, Tarn Taran (Punjab) and ICAR-ATARI, Ludhiana. S. Singh regularly visits the KVK campus to gain first hand latest knowledge regarding agriculture and livestock farming. It is pertinent to mention here that S. Gurbachan Singh first time narrated the incidence of fixing marriage of his son on the condition that bride's father will not burn crops residue on his farms during the Stakeholders' Meet at ICAR-ATARI, Ludhiana on 15th March, 2018 which was shared with media and consequently it reached to PMO. Hon'ble Prime Minister of India, Sh. Narendra Modi recognised the contribution of S. Gurbachan Singh efforts in paddy straw management in "*Mann Ki Baat*" (Episode 49, 28 October 2018) programme.



**A progressive farmer recognized in Mann Ki Baat by hon'ble Prime Minister**

Hon'ble Prime Minister also recognised Kalar Majri village (near Nabha Tehsil of Patiala) for its dedicated work of residue management which was declared as Zero Stubble Burning Village in the convergence mode where KVK, Patiala and Agriculture department worked together for making this village Burning Free during 2017. He admired all farmers of this village for this unique work and urged others to follow the path shown by Kalar Majri.

## Glimpses



## Glimpses



**Kaushal vikas (कौशल विकास) :** Resolving the problem of residue burning demands adoption of new machines by the farmers. But, this adoption also requires knowledge and skills in terms of operating machines, their calibration, maintenance and remedies if any problem arises. The do's and don'ts of using machinery is essential for their long term usage and effective management of crop residues. Moreover, lack of skills may also prevent farmers from adopting or purchasing machines as they may find the technology complex and tricky. Therefore, capacity building of farmers and machine operator was considered fundamental not only to ensure the timely operations and efficiency in machine usage but also in terms of developing confidence among farmers.



**Farmers being educated by the KVK staff regarding the benefits of using Happy Seeder**

Before training farmers and machine operators, it was decided to provide refresher training to the KVK scientists about nooks and crannies of *in-situ* residue management machinery. ICAR-ATARI, Ludhiana in collaboration with Department of Farm Machinery and Power Engineering, PAU, Ludhiana organized capacity building programme on “In-situ paddy residue management through machinery” for the experts of KVKs of Punjab, Haryana and Uttar Pradesh during early August. These training programs aimed at providing technical know-how of machines, their usage etc. along with the details of the Central Scheme and expectations out of KVKs. Live demonstrations on machine operations, hands-on training sessions and visits to machine fabricators, custom hiring centres etc. were also organized. The participants were encouraged to develop a common understanding on the scheme and clear their all the doubts about the technologies. They were asked to provide feedback to the research system for timely upgrades in the technology packages.

KVK scientists organized more than **400 hands-on trainings** for about **20,000 farmers, tractor owners and machine operators** on managing crop residue with the machines, their



#### **Hands-on training provided to the farmers for effective use of machinery**

calibrations, maintenance etc. The participants were specifically apprised about the combo technology of Super Straw Management System (Super-SMS) and Happy Seeder and its multi-benefits. Participants were provided literature on effective usage of machines in the field, certain specific tips, do's and don'ts etc. Special Question-Answer (Q&A) sessions were conducted to remove doubts and bring clarity in terms of using machines. These trained farmers and operators were not only expected to use machines effectively and efficiently in their own fields but also to guide their fellow farmers.

**Demonstrating the potential of technologies:** KVK experts organized live method demonstrations on operating machines and sowing wheat while managing paddy straw effectively. Result demonstrations on Happy Seeder sown wheat, Zero-Till drill sown wheat etc. were also conducted in the farmers' fields to display actual field condition. The farmers were free to see the crop condition at any point of time and were expected to try out the same in their farms. Moreover, few active and curious farmers were selected during exposure visits and discussions to conduct demonstrations on their fields. Thus, demonstrations in the farmers' fields on different in-situ residue management technologies were organized in more than **12,000 ha** while obtaining participation of around **20,000 farmers**. Similarly, around **200 exposure visits** were organized, in which the farmers from other villages were taken to show demonstrated the potential of technologies in the field.

**Field Days and Harvest Days:** Demonstrations displayed effectiveness of machines in



**Machineries being demonstrated live by KVKs for managing the paddy straw**

managing paddy residue; and now, it was time for showcasing their impact on wheat yields. Therefore, Harvest Field Days were organized to bring farmers to locations of demonstrations to witness results in terms of wheat yields. It enabled Farmer-to-Farmer (F2F) dialogue and exchange of experiences and reflections. Thus, more than **200 Field Days and Harvest Days** were organized across three states in which more than **10,000 farmers** participated. Farmers were motivated to celebrate *Baisakhi* as “*No Crop residue Burning Day*” and were informed about alternative residue management technologies. KVKs collaborated with officials of ATMA and State Department of Agriculture & Farmers' Welfare for wider impact of the program. Farmers' reflections were noted and published in local newspapers for popularizing the multi-benefit combo technology of Super Straw Management System (Super-SMS) and Happy Seeder.



**Harvest Field Day being celebrated by KVK**



# Glimpses from Punjab



**HOW A PUNJAB FARMER IS SHOWING THE WAY IN CROP BURNING FIGHT**

**TRACKING CHANGE EVERY WEEKLY**

**THE INDIAN EXPRESS**

## पराली जलाने से तौबा करने लगे किसान

किसानों को दी पराली जलाने के नुकसान के बारे में जानकारी

**‘हम भी पर्यावरण प्रेमी, पराली का समाधान कराए सरकार’**

पराली नही जलाने पर्यावरण बचानी

जलाने से नुकसान का पता चलने लगा है। किसानों को पराली जलाने के नुकसान के बारे में जानकारी दी गई है। किसानों को पराली जलाने के नुकसान के बारे में जानकारी दी गई है।

**जगजगता**

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# Glimpses From Haryana



**जागरण सिटी फतेहाबाद** दिनांक: 18 अक्टूबर 2018 **कृषि विज्ञान केंद्र** 17

## फसल अवशेषों का प्रबंधन कर मुनाफा कमा सकते हैं किसान

कृषि विज्ञान केंद्र में दैनिक जागरण के तत्वावधान में **प्रशिक्षण शिविर** में डंगरा और हड़ौली के 50 किसानों ने सिखे गुर

**पराधी नहीं जायाएँ**

किसानों को फसल अवशेषों का प्रबंधन करने के लिए प्रशिक्षण शिविर में शामिल किया गया। शिविर में किसानों को फसल अवशेषों का प्रबंधन करने के लिए प्रशिक्षण शिविर में शामिल किया गया। शिविर में किसानों को फसल अवशेषों का प्रबंधन करने के लिए प्रशिक्षण शिविर में शामिल किया गया।

20 अक्टूबर को कृषि विज्ञान केंद्र में प्रशिक्षण शिविर का आयोजन किया गया। शिविर में किसानों को फसल अवशेषों का प्रबंधन करने के लिए प्रशिक्षण शिविर में शामिल किया गया।

शिविर में किसानों को फसल अवशेषों का प्रबंधन करने के लिए प्रशिक्षण शिविर में शामिल किया गया। शिविर में किसानों को फसल अवशेषों का प्रबंधन करने के लिए प्रशिक्षण शिविर में शामिल किया गया।

# Glimpses from Uttar Pradesh



### फसल अवशेष प्रबंधन के बारे में दी जानकारी

संयोजक: कृषि विज्ञान केंद्र से जहां वैज्ञानिकों को ज्ञान है उसमें ही किसान अवशेष प्रबंधन परियोजना के विचार में आसानी से। उन्होंने बताया कि इस परियोजना में विशेषज्ञों को अनुभव वाले अनुसंधान को लागू करना भी सिखाया जा सकता है।

उपस्थित को विज्ञान प्रबंधन जगह से जहां कृषि विज्ञानिकों को ज्ञान है उसे किसानों को भी देना है। किसानों को अवशेष प्रबंधन के विचारों को लागू करने में मदद करने के लिए किसानों को प्रशिक्षण देना होगा। इस परियोजना के अंतर्गत कृषि विज्ञान केंद्रों में किसानों को प्रशिक्षण देना होगा।

कृषि विज्ञान केंद्र रामपुर में किसानों को प्रशिक्षण देना होगा। इस परियोजना के अंतर्गत कृषि विज्ञान केंद्रों में किसानों को प्रशिक्षण देना होगा।

### अमर उजाळा कोसी-छाता-राय न पुआल जलाओ, न जलाने दो

फसल अवशेष प्रबंधन की कार्यशाला में किया जागरूक

कृषि विज्ञान केंद्र रामपुर में आयोजित कार्यशाला में किसानों को फसल अवशेष प्रबंधन के विचारों को लागू करने में मदद करने के लिए किसानों को प्रशिक्षण देना होगा।

कृषि विज्ञान केंद्र रामपुर में आयोजित कार्यशाला में किसानों को फसल अवशेष प्रबंधन के विचारों को लागू करने में मदद करने के लिए किसानों को प्रशिक्षण देना होगा।

### बिना रीपर के कंबाइन से धान की कटाई पर रोक

कृषि विभाग ने दिए निर्देश

कृषि विभाग ने किसानों को बिना रीपर के कंबाइन से धान की कटाई करने से रोकने के लिए निर्देश दिए हैं।

कृषि विभाग ने किसानों को बिना रीपर के कंबाइन से धान की कटाई करने से रोकने के लिए निर्देश दिए हैं।

## IMPACT OF IEC ACTIVITIES

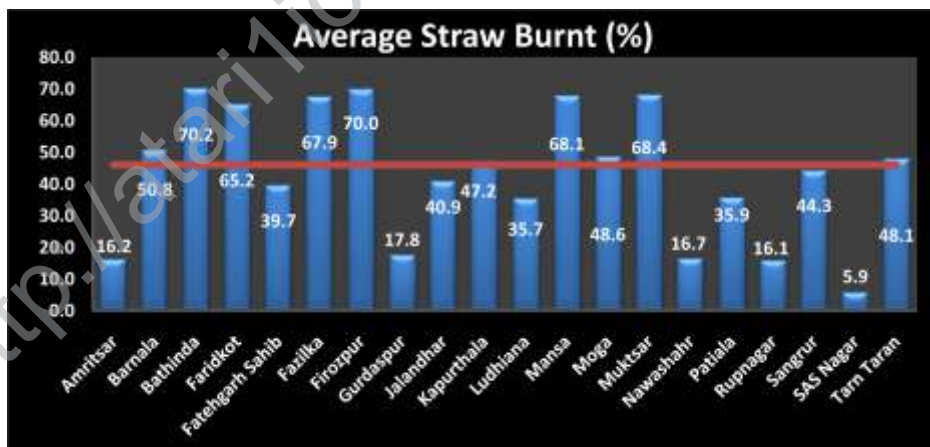
In order to know the effect of various activities carried out under this project in term of area expansion, improvement in air quality and monetary benefits, data on different aspects were collected from different agencies like CREAMs, PSRSC, PSPCB, Department of Agriculture etc., and analyzed which are described below:

### I) *Impact on Paddy Residue Burning*

The paddy residue burning was monitored by multiple satellites with thermal sensors during the paddy harvest and wheat sowing season period from 30 September to 30 November in the states of Punjab, Haryana and Uttar Pradesh. High resolution satellite images at 20 m were acquired for pre-burning and post-burning period to map paddy acreage and paddy area burnt in 20 districts of Punjab and 10 districts of Haryana during 2018. The area statistics were used to estimate paddy straw burnt by the Indian Council of Agricultural Research's (ICAR) Consortium for Research on Agro-ecosystem Monitoring and Modeling from Space (CREAMS) Laboratory at Division of Agricultural Physics, Indian Agricultural Research Institute (IARI), New Delhi.

### PUNJAB

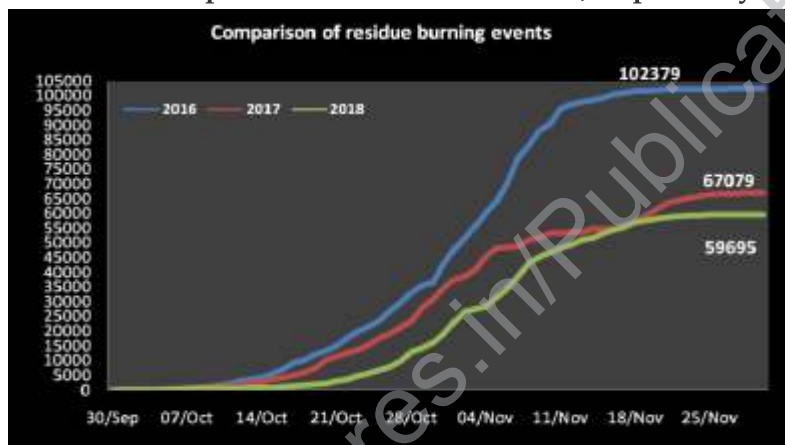
In Punjab during 2018, remote sensing estimated burning in 1.51 mn ha paddy area (51%) out of total 2.96 mn ha area planted for 20 major paddy growing districts. The estimates suggest burning of 11.81 Mt paddy straw (46.4%) out of total 25.48 Mt, on dry weight basis.



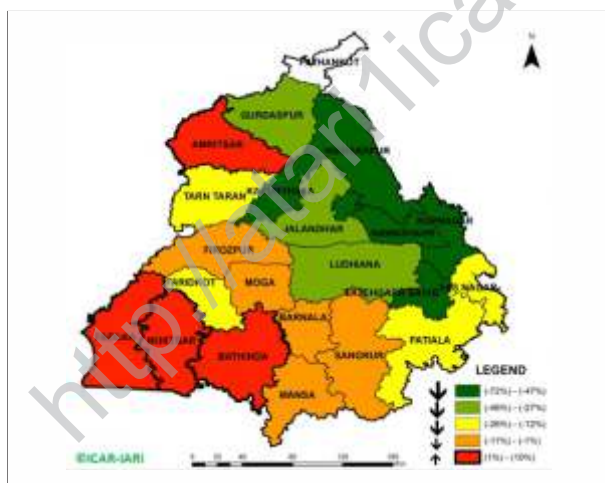
District-wise burning of paddy residue

Firozpur, Sangrur and Muktsar districts reported highest paddy area burnt and highest burning events in 2018. Bathinda, Firozpur, Muktsar, Mansa, Fazilka and Faridkot districts reported burning in more than 70% of their paddy area in 2018.

The number of burning events detected during 2016, 2017 and 2018 were 102379, 67079, and 59695, respectively. About 11.01% and 41.69% reduction in number of burning events were observed in 2018 as compared to that in 2017 and 2016, respectively.



Comparison between number of residue burning events in 2016, 2017 & 2018

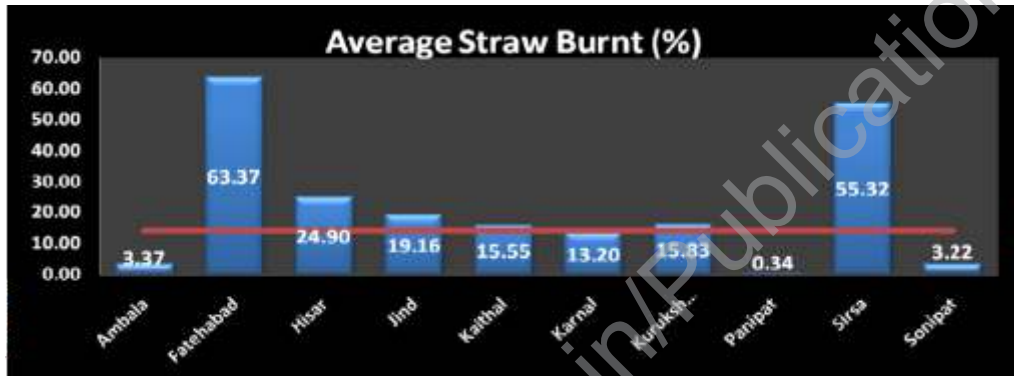


Change in fire events of 2018 with respect to 2017

The districts of Hoshiarpur, Kapurthala, Nawanshahar (SBS Nagar) and Ropar witnessed 47% to 72% lesser burning events in 2018 as compared to 2017. Similarly, Gurdaspur, Jalandhar and Ludhiana districts reported 27% to 46% reduction in burning; whereas it was 12% to 26% for Mohali (SAS nagar), Patiala, Faridkot and Tarn Taran districts. At the same time, an increase of 1% to 10% in number burning events was observed in Amritsar, Fazilka, Muktsar and Bathinda districts.

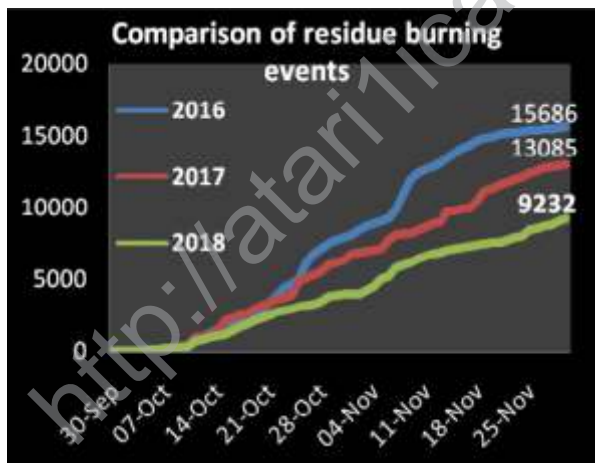
## HARYANA

In the state of Haryana during 2018, remote sensing estimated burning in 0.23 Mha area (22.12%) out of total 1.04 Mha area planted for 10 major paddy growing districts. The estimate suggests burning of 1.60 Mt paddy straw (14.04%) out of total 7.55 Mt on dry weight basis.

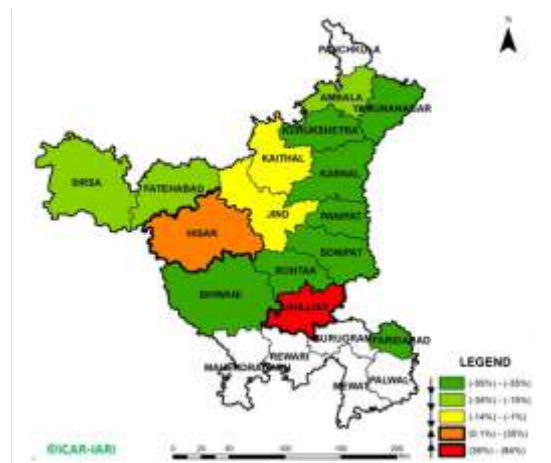


District-wise burning of paddy residue

Fatehabad (70.6%) and Sirsa (61.6%) districts reported highest paddy area burning during the year. The number of burning events detected during 2016, 2017 and 2018 were 15686, 13085 and 9232 respectively.



Comparison between number of Residue burning events in 2016, 2017 and 2018



Change in fire events of 2018 with respect to 2017

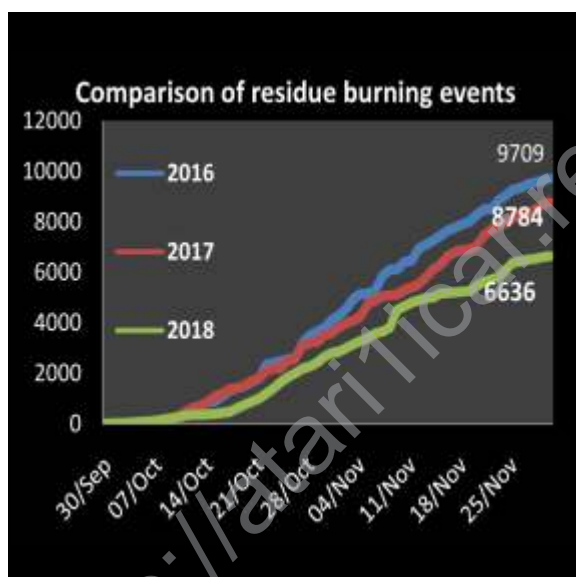
About 29.45% and 41.15% reduction in number of burning events were observed in 2018 as compared to that in 2017 and 2016, respectively.

The districts of Yamunanagar, Kurukshetra, Karnal, Panipat, Sonipat, Rohtak and Bhiwani recorded reduction in the number of events of burning as high as 35% to 55%. Whereas, districts of Jhajjar and Hisar reported rise in the burning events.

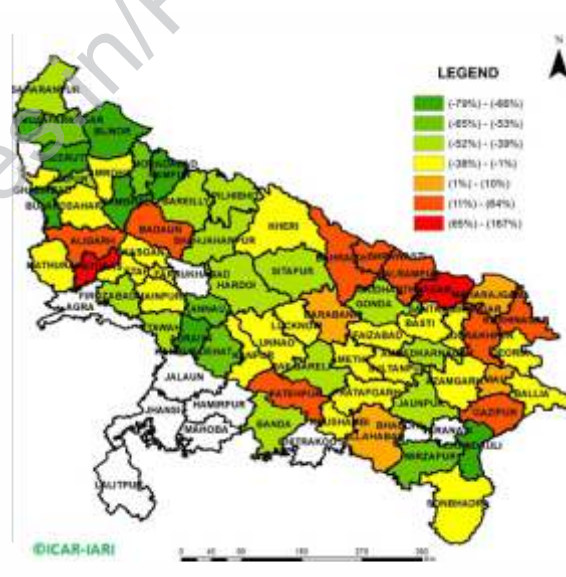
### UTTAR PRADESH

Maharajganj (1092) and Mathura (1051) districts of Uttar Pradesh reported highest number of burning events in 2018. The number of burning events detected during 2016, 2017 and 2018 were 9709, 8784 and 6636 respectively.

About 24.45% and 31.65% reduction in number of burning events were observed in 2018 as compared to that in 2017 and 2016, respectively.



Comparison between number of residue burning events in 2016, 2017 & 2018

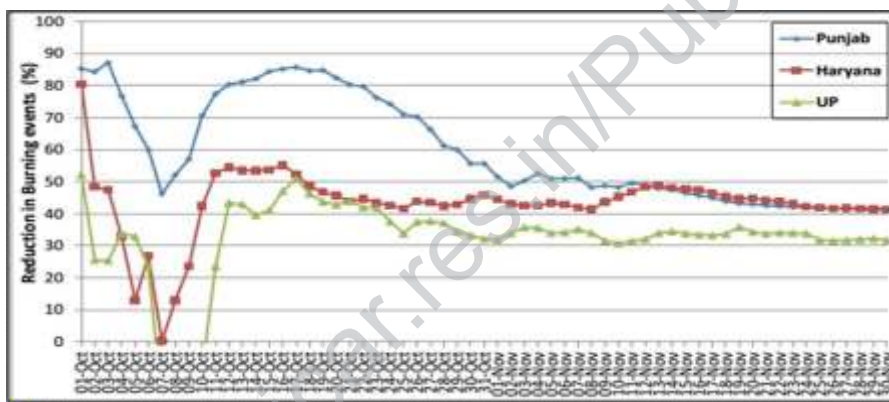


Change in fire events of 2018 with respect to 2017

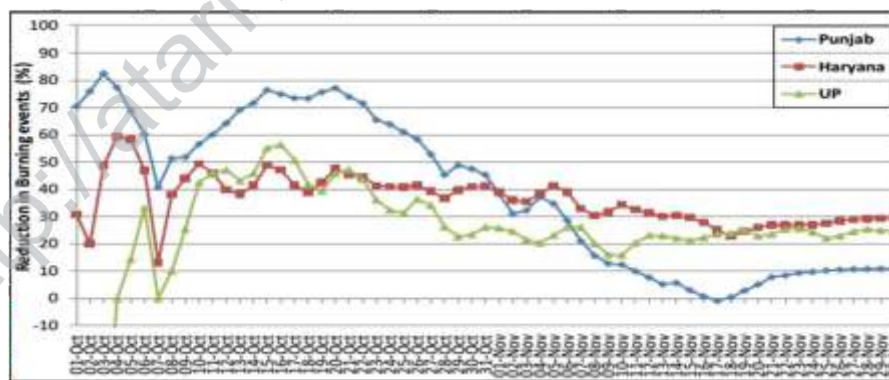
Few districts like Muzafar-nagar, Bijnor, Meerut, Sambhal etc. reported significantly huge (66% to 79%) reduction in the burning events; whereas, few district like Mathura, Aligarh, Badaun, Gazipur etc. recorded rise in the burning events.

## OVERALL IMPACT

Out of the total residue burning events during 2018, Punjab recorded 59695 (79%), Haryana 9232 (12%) and UP 6636 (9%). The majority of burning events were recorded between 27<sup>th</sup> October and 09<sup>th</sup> November. During the year, about 23 Million tons of GHGs (Green House Gases) and Particulate matter (PM) was estimated to be emitted from paddy residue burning in the three states, in which Punjab contributed 83%, Haryana contributed 11% and UP contributed 7%. CO<sub>2</sub> emissions contributed 93.7% of the total pollutants emissions. Total burning events detected for the three states were 127774, 88948, and 75563 in the years 2016, 2017 and 2018, respectively. **Overall, about 15% and 41% reduction in number of burning events were observed in 2018 as compared to that in 2017 and 2016, respectively.**



Reduction in burning events in 2018 over 2016



Reduction in burning events in 2018 over 2017



The comparison between fire intensity classes between the events of 2018 and 2017 suggest change of about 1.2% (Punjab), 5.5% (Haryana) and 4.6% (Uttar Pradesh) of fire event's intensity from very high to low. This change in terms of fire intensity signifies shift towards partial burning of residue implying lower emission of particulate matter.



Comparison between fire intensity classes between 2018 & 2017

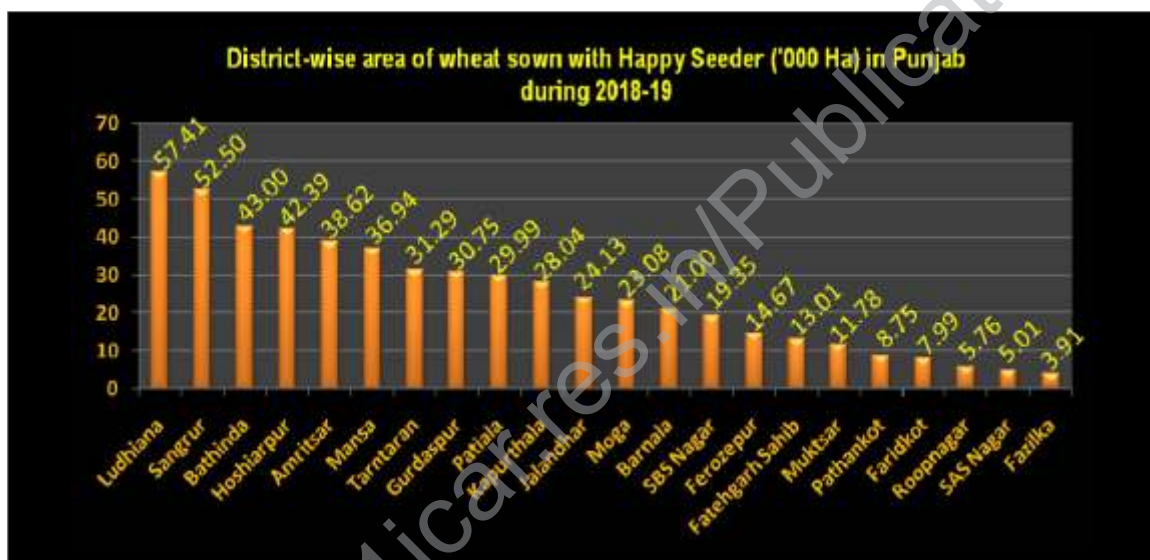
## ii) Impact on Spread of Happy Seeder/Zero Tillage Technology

KVKs of Punjab, Haryana and Uttar Pradesh have worked relentlessly to shun the residue burning and popularize *in-situ* residue management in the region.

Adoption of *in-situ* crop residue management practices was found to be the best remedy against crops residue burning. Subsequently, the scheme implementation happened at unprecedented pace and wheat area under zero paddy straw burning during 2018 increased to 8 lakh ha from just a meager area of about 50,000 ha in 2017. Punjab Remote Sensing Centre (2019) estimated that the wheat area under Happy Seeder in Punjab was at 5.49 lakh ha, while it was not possible for remote sensing

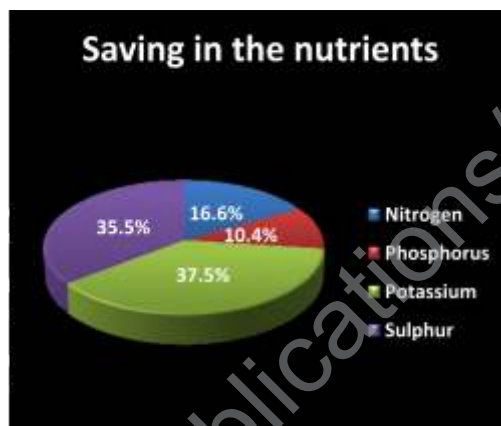


technology to assess area under residue incorporation. The district wise Happy Seeder sown wheat area in Punjab was the highest in Ludhiana (57,410 ha) followed by Sangrur (52,500 hectare), while the minimum area was in Fazilka (3,910 ha). Print media reported the estimated figure of 6 lakh ha of wheat sown area under paddy residue management (zero paddy straw burning) using various approaches during 2018 (The Indian Express, 21 December 2018). Thus, about 0.8 million ha (19%) of area was sown by direct seeded wheat (Happy Seeder & Zero-Till drill) in Punjab & Haryana combined during 2018-19.



**Impact in monetary terms:** The direct seeding of wheat with Happy Seeder/ Zero-till drill results into saving of precious inputs as wheat is directly sown in standing stubbles. Our earlier studies based on 4100 demonstrations laid on 1640 ha clearly indicate saving of cost of cultivation to the tune of Rs. 4500 ha<sup>-1</sup>. This saving is mainly due to reduction in the cost of tillage (64.8%), cost of weed management (24%) and cost of irrigation management (11.1%). If we extrapolate on an area of 0.8 million ha, the saving into cost of cultivation is 360 Crore year<sup>-1</sup> in the states of Punjab and Haryana during 2018.

Similarly, the equivalent value of loss of nutrients due to burning of paddy straw is estimated to be Rs. 3300 per ha; thus, the total value of nutrient loss due to burning of paddy straw is Rs.264 Crore/year. The saving in terms of cost nutrients can be attributed to saving



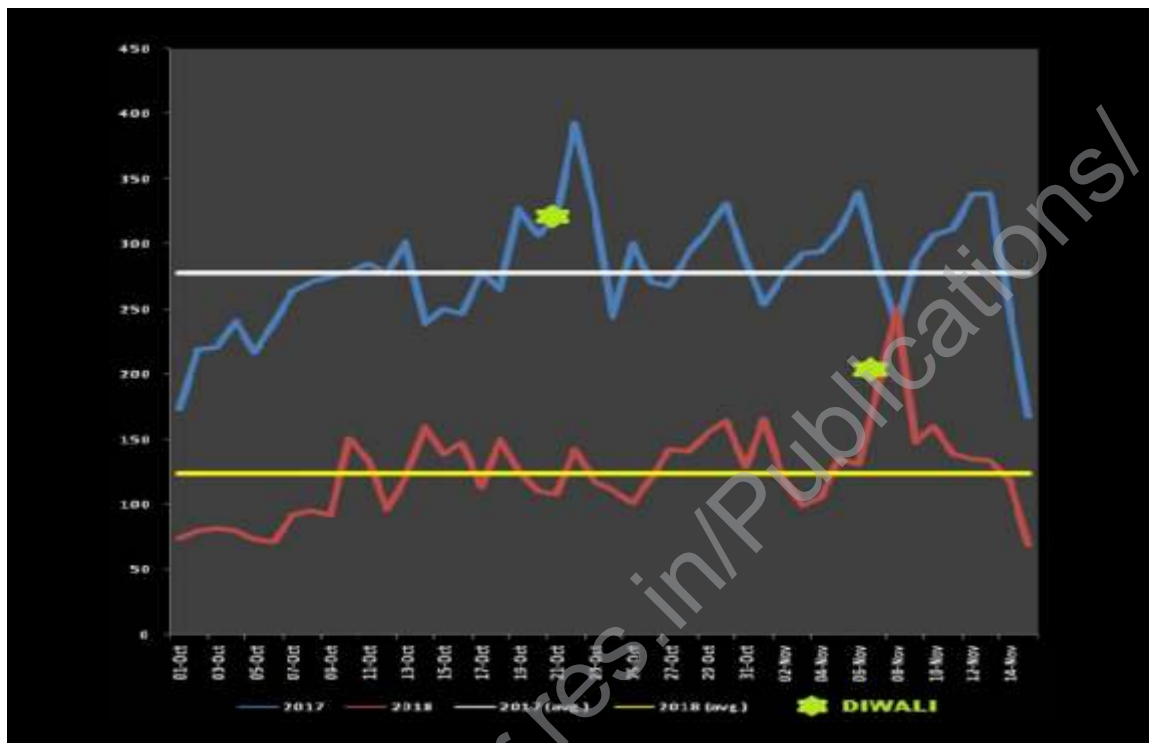
for nitrogenous fertilizers (16.6%), phosphatic fertilizers (10.4%), potash (37.4%) and elemental sulphur (35.4%). Sowing wheat crop with happy seeder also resulted in saving of irrigation water of 7cm/ha or 700 m<sup>3</sup>/ha and a total water saving of is 560 Million Cubic Meter (MCM). In addition to this, it also helps in overall improvement in air quality due to non-burning of paddy residue and other eco-services.

### iii) Impact on Air Quality

The quality of air is measured in terms of Air Quality Index (AQI), which considers the quantity of eight parameters in the air namely PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO, O<sub>3</sub>, NH<sub>3</sub> and Pb. Punjab Pollution Control Board (PPCB) is monitoring AQI through eight Continuous Ambient Air Quality Monitoring Stations (CAAQMS) across Punjab.

The Air Quality Indices for Punjab during 1<sup>st</sup> October to 15<sup>th</sup> Nov suggest that there was significant improvement in the air quality during 2018 as compared to that in 2017. Punjab Government issued data of air quality on National Pollution Control Day depicts that the Air Quality Index was **273 (Poor- breathing discomfort to most people on prolonged exposure)** during November, 2017 which has significantly reduced to **132 (Moderate – Breathing discomfort to the people with lungs, asthma and heart diseases)** during November, 2018. The range of AQIs during 2017 was from **168 to 393 (Moderate to Very Poor)**, which has come down **69 to 251 (Satisfactory to Poor)** in 2018.

Moreover, the sharp rise in AQI during 21<sup>st</sup> October 2017 immediately followed by sharp decline can be attributed to the festival of *Diwali*, which was on 19<sup>th</sup> October. Since, the



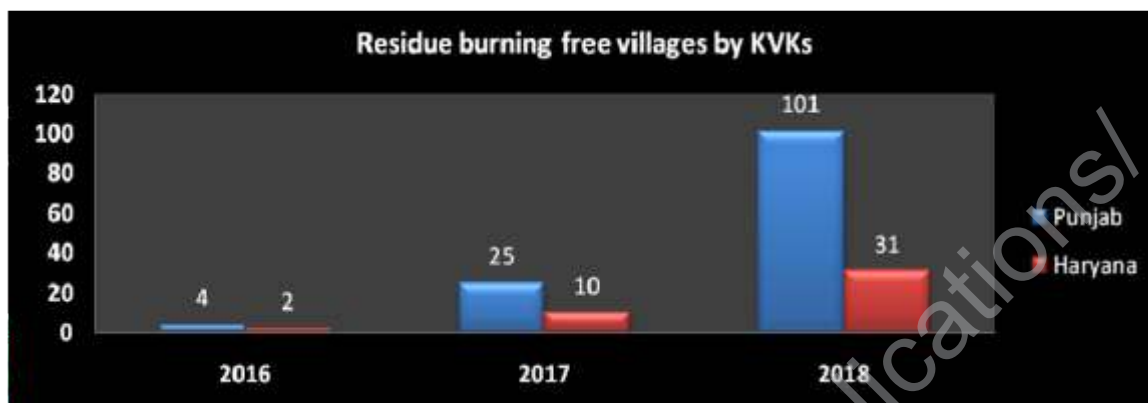
**AQI of Punjab from 1st Oct to 15th Nov**

festival was in October in 2017, a sharp decline in AQI was also noticed after 12<sup>th</sup> November. Similarly, the sharp rise in AQI on 8<sup>th</sup> November immediately followed by a sharp decline was due to *Diwali* on 7<sup>th</sup> November in 2018. Therefore, the decline in AQI after 12<sup>th</sup> November in 2018 was not as sharp as that in 2017.

*iv) Impact on Residue Burning Free Villages*

Each KVK has focused 3-5 adopted villages where intensive efforts were carried out for converting these villages into residue burning free villages. KVK Team worked with farmers and *Panchayats* in participatory mode. Consequently, in Punjab and Haryana, **132 villages** were declared as almost Stubble Burning Free in 2018 covering more than 45,000 hectares. Villages where eighty to eighty five percent residues were managed without burning were considered as nearly zero burning villages.

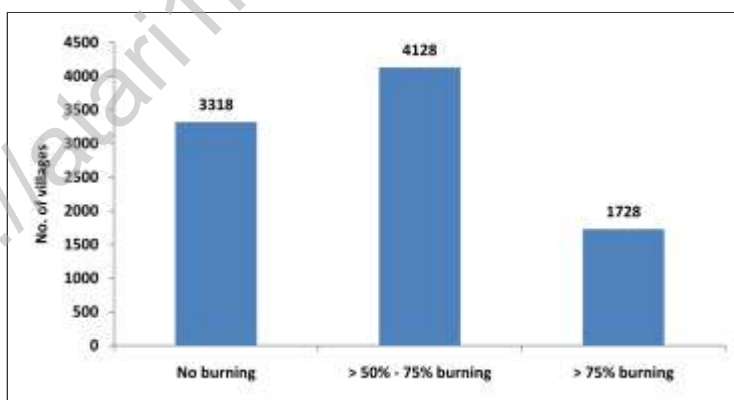
Further, **1341 villages** across Punjab (out of about 8000 villages where paddy is being



Villages freed from residue burning by KVKs of Punjab and Haryana

grown, which constitute about 17%) were declared as **Zero Stubble Burning Villages** during 2018. Similarly, nearly 3200 villages (72%) of Haryana out of total 4400 paddy growing villages reported no burning during 2018.

The final estimate of Consortium for Research on Agroecosystem Monitoring and Modeling from Space (CREAMS) Laboratory, IARI, New Delhi suggest that out of total 12627 paddy growing villages of Punjab, 3318 villages (26%) reported almost no burning during 2018. High percentage of burning was observed in south-western and border districts of the state. Similarly, nearly 3200 villages (72%) of Haryana out of total 4400 paddy growing villages reported no burning during 2018.

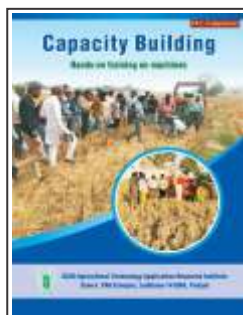
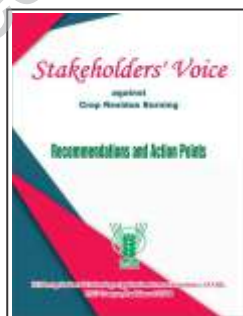
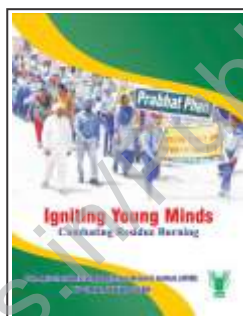
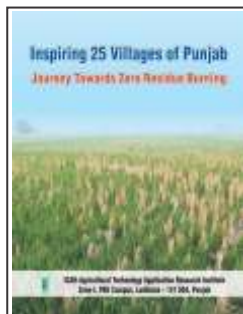
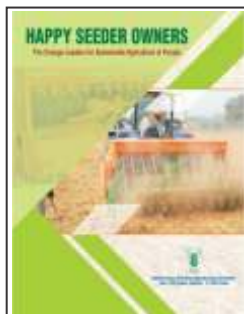


Extent of Paddy residue burning in villages of Punjab (2018)

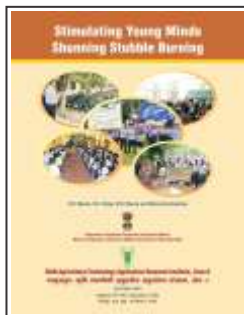
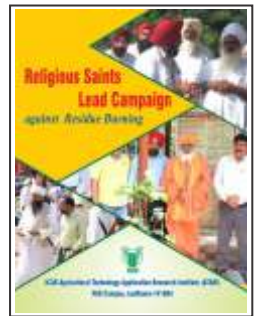
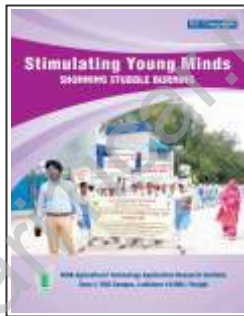
## Learning from CRM Scheme Implementation

- 1) Concrete efforts should be made to ensure attachment of SMS with the combined harvesters. Enforcement of this in letter and spirit will discourage burning, particularly the partial burning.
- 2) Intensive efforts should be made to utilize machines available with the Cooperative societies so as to use these machines to the fullest capacity. Maintaining log books and other strict monitoring measures should be kept in place.
- 3) Information regarding machines availability with Custom Hiring Centres, Cooperative Societies etc. should reach well in advance to the farmers particularly in farflung areas.
- 4) More machines and awareness activities are needed in the interior areas particularly in the border belt.
- 5) Previous experiences indicate increase in fire events during holidays (Saturdays, Sundays, festivals etc.); therefore, state department officials must work with farmers for residue management on the holidays at least during peak season i.e. 25<sup>th</sup> October to 15<sup>th</sup> November.
- 6) States should formulate list of all nodal officers well in advance and their duties must be well defined for residue management.
- 7) The technology package for Happy Seeder sown wheat needs to be standardized in terms of seed rate optimization, time and schedule of first irrigation, fertilizer application and weed management measures.
- 8) More scientific studies are needed for defining the use of mulcher and specific recommendations should be communicated at the earliest.
- 9) College students should be involved and trained about crop residue management. Every student should teach at least ten farmers (Each One, Teach Ten) to reach the unreached quickly.
- 10) Small and marginal farmers, who do not burn residues, may suitably be incentivized and honored for popularization of *in-situ* residue management.
- 11) Convergence is the most powerful tool; hence, all stakeholders should work as a team to mobilize farmers in a mission mode.
- 12) Volunteers/scouts/para-extension workers should be involved and each village should have at least one of these to convey timely messages.

## Publications on Crop Residue Management



## Publications on Crop Residue Management





# MEDIA APPEARANCE

**पराली नहीं जलाएंगे, पर्यावरण बचाएंगे** VII

## कामयाब हो रहा पराली नहीं जलाने का आह्वान : डॉ. त्रिलोचन

जलजल के नरेश दत्तने आरंभिक पराली नहीं जलाने की परामर्शना की बाबाएरी। कांठिकन में रीकाी विरल-नें दे रिकल रिंरल, कांठिकन कृषि अनुसंधान परिषद के पर्यावरणिक व वी जनकनी

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## Ropar tops with 60 pc decline in stubble fires

Highest number of crop residue-burning cases reported from Sangrur

**Environment News Service**  
 A nation of farmers has requested assistance in the form of state government to not burn stubble residue, reveals data from Punjab Revenue Department, Ludhiana.  
 Additional Chief Secretary (Development) Vikramjit Singh and Manoj Singh, Joint Secretary (Revenue) and Preet Singh, Joint Secretary (Revenue) are the last of stubble residue burning as compared to last year. The last year the total number of stubble burning cases reported in Punjab was around 1,000 cases.



Ropar (14 per cent) and Sangrur (10 per cent) are the districts with the highest number of stubble burning cases. The districts with the lowest number of stubble burning cases are Patna (10 per cent) and Amritsar (15 per cent). The total number of stubble burning cases reported in Punjab is 1,000 cases.

## Happy Seeder gives them a head start

PAVESH SARMAN

**SANGRUR, NOVEMBER 6**  
 While most farmers of the district are busy burning paddy stubble in their fields, there are some in whose fields young wheat plants have become visible as they have sown wheat without burning stubble.  
 "With the motivation of my village farmers and administrators, I have sown wheat first time with Happy Seeder on 12 acres without burning stubble. Wheat plants have become visible. I have sown wheat at the cost of Rs 500 per acre without burning stubble, but other farmers would spend around Rs 2,000 per acre to sow wheat, and that too, after burning stubble and causing grave pollution," said Kuldip Singh, a farmer

Source in the local Agriculture Department office informed that till last year, there were only 700 Happy Seeders in Sangrur district while this year the number had increased to 1,300, while 200 more were being released in a few days. In Sangrur, wheat would be sown over 1,000 lakh hectares. Agriculture officers say that they have been trying to facilitate the sowing of 40-50 per cent wheat without burning stubble with Happy Seeders.  
 Leaders of the BKU Ugrahan are demanding special financial help for farmers for managing stubble without burning. "The state government is trying to pressure farmers to manage stubble without burning by spending

## गांव गुन्नावाल के किसानों ने पराली नहीं जलाने का लिया संकल्प

दैनिक जलजल पराली नहीं जलाने, पर्यावरण बचाएने का चला राह है अभियान

**‘ग्रामीण छात्र अपने पिता से पराली न जलाने की लें शपथ’**

पराली जलाने वाले सरकारी मुताजिमों पर होगी कार्रवाई

किसानों ने पराली नहीं जलाने का संकल्प लिया है। वे पराली जलाने से परहेज करेंगे और पर्यावरण बचाएंगे।

ग्रामीण छात्रों ने अपने पिता से पराली न जलाने की शपथ ली है। वे पराली जलाने से परहेज करेंगे और पर्यावरण बचाएंगे।

पराली जलाने वाले सरकारी मुताजिमों पर कार्रवाई होगी। वे पराली जलाने से परहेज करेंगे और पर्यावरण बचाएंगे।



हर कदम, हर डगर

किसानों का हमसफर

भारतीय कृषि अनुसंधान परिषद

*Agrisearch with a human touch*