

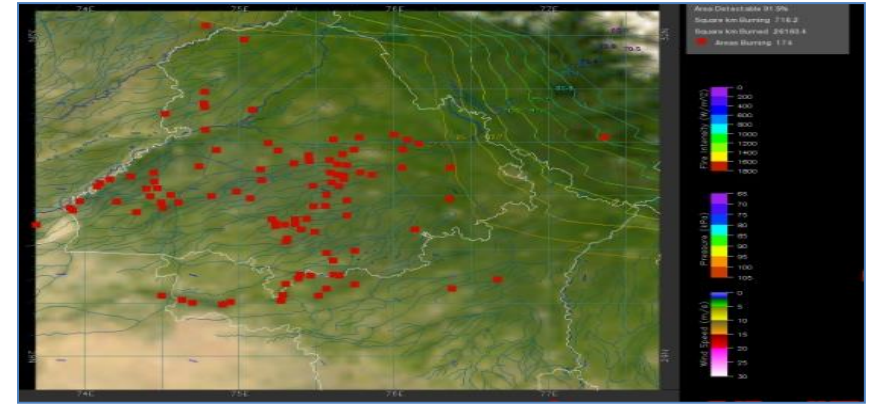
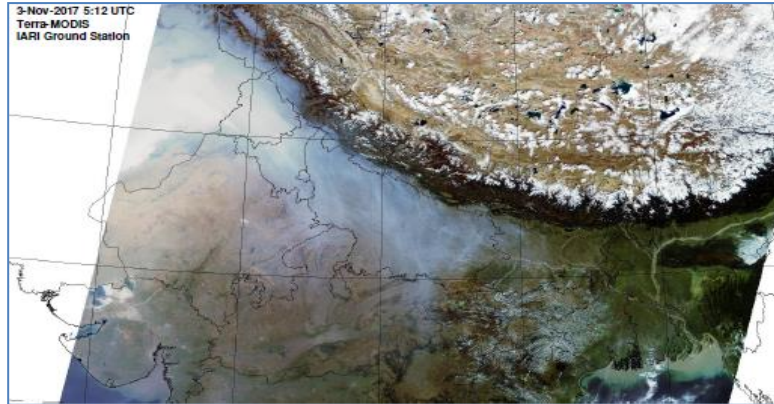


MONITORING PADDY RESIDUE BURNING IN INDIA USING SATELLITE REMOTE SENSING DURING 2023

Bulletin
No. 08

Events Date:
22-Sep-2023

Issued on:
22-Sep-2023



Consortium for Research on Agroecosystem Monitoring and Modeling from Space (CREAMS)
Laboratory,

Division of Agricultural Physics, ICAR – Indian Agricultural Research Institute, New Delhi – 110012

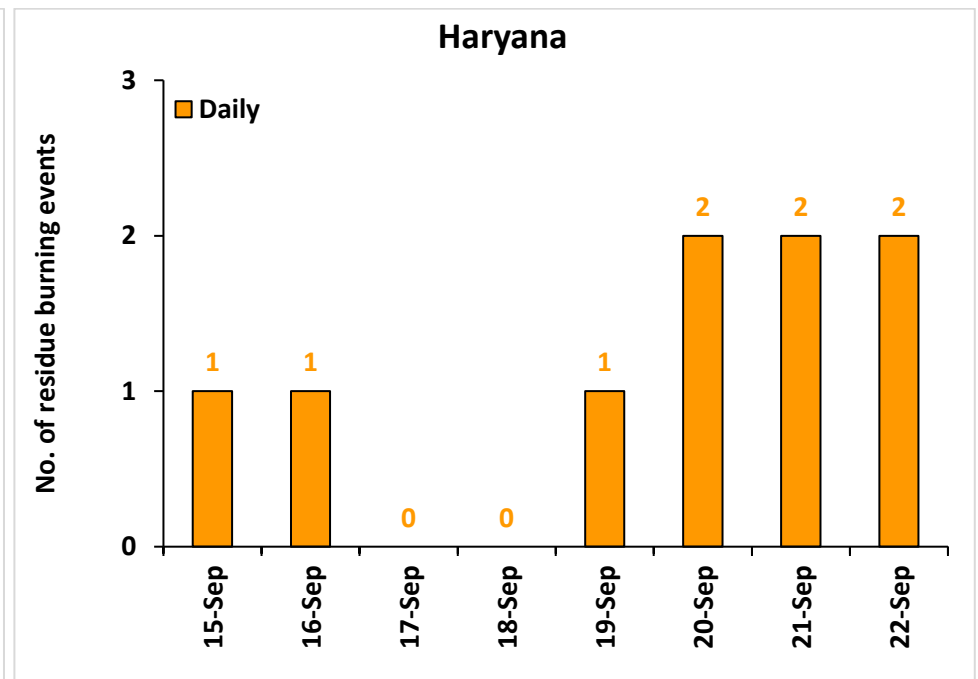
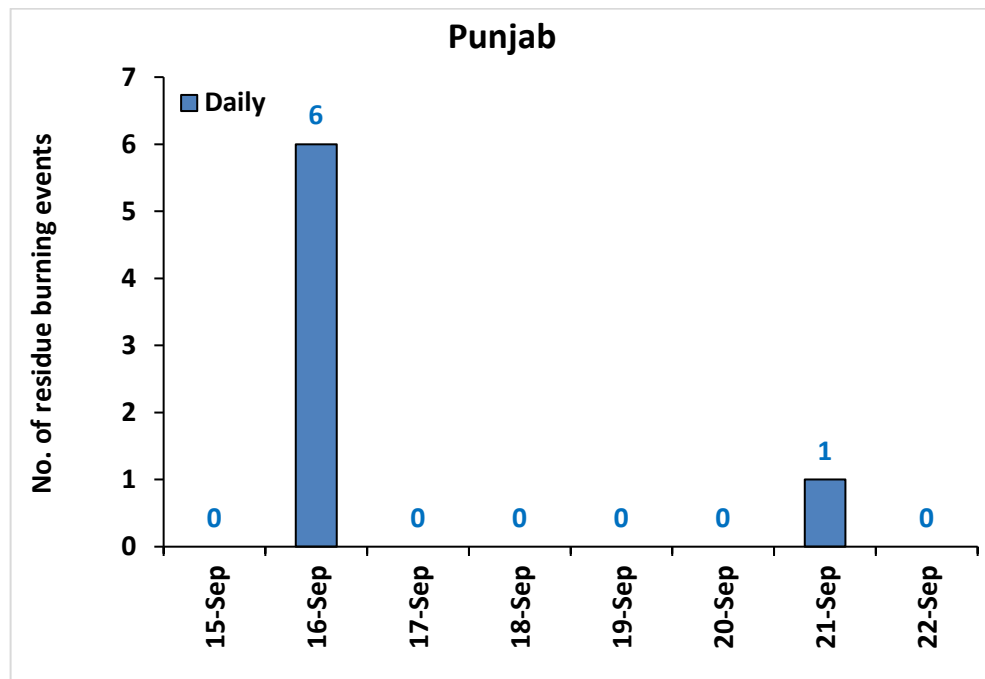
<http://creams.iari.res.in>



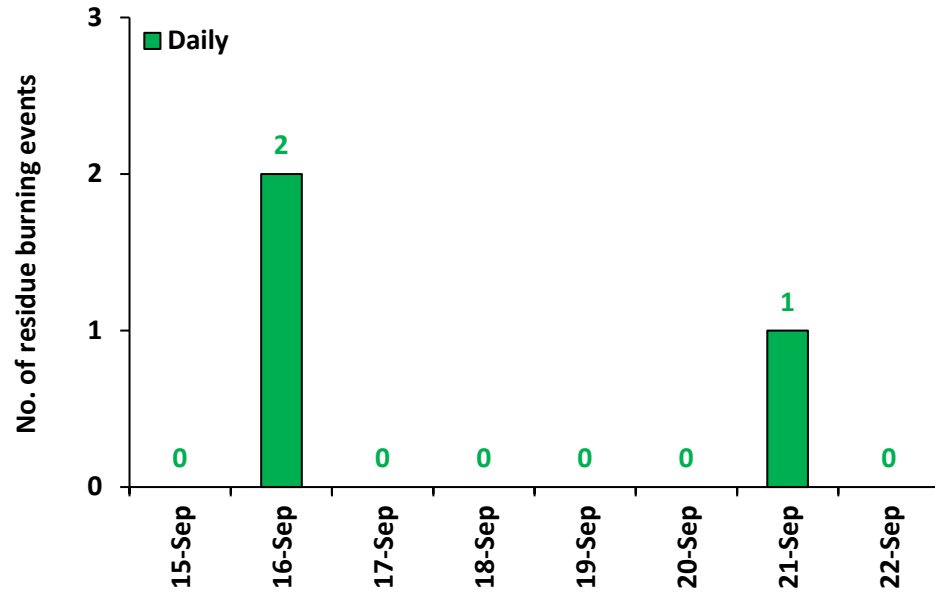
Highlights for 22-Sep-2023

- The active fire events due to rice residue burning were monitored using satellite remote sensing, following the "Standard Protocol for Estimation of Crop Residue Burning Fire Events using Satellite Data".
- Satellites detected **02** residue burning events in the six study States on 22-Sep-2023.
- The state wise events detected on 22-Sep-2023 were **00** in Punjab, **02** in Haryana, **00** in UP, **00** in Delhi, **00** in Rajasthan and **00** in MP.
- Total **21** burning events were detected in the six states between 15-Sept-2023 and 22-Sep-2023, which are distributed as **07**, **09**, **03**, **00**, **00** and **02** in Punjab, Haryana, UP, Delhi, Rajasthan and MP, respectively.
- Detection of residue burning events was hampered by the presence of clouds over Punjab, Uttar Pradesh, and Madhya Pradesh states.

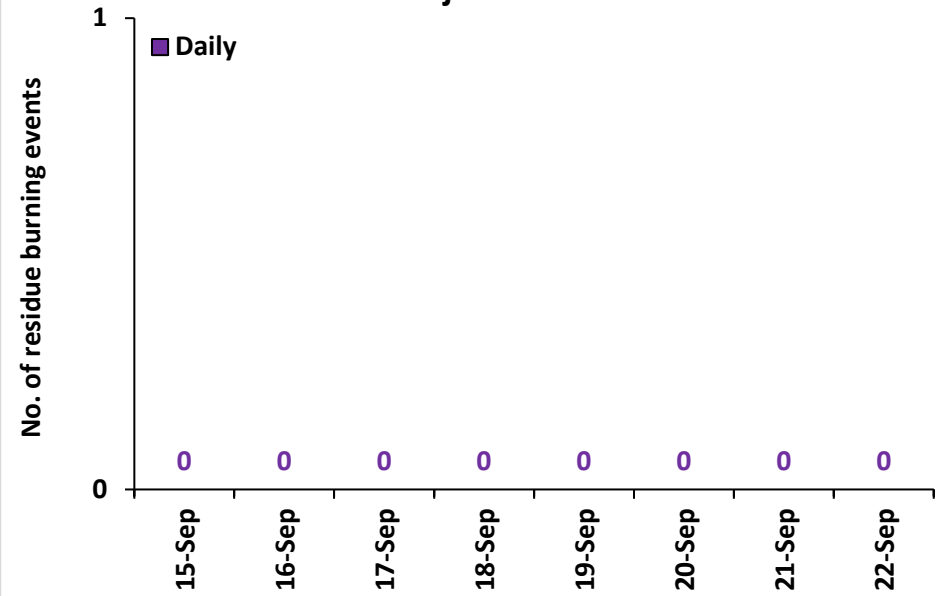
Temporal distribution of rice residue burning events for the study States in 2023



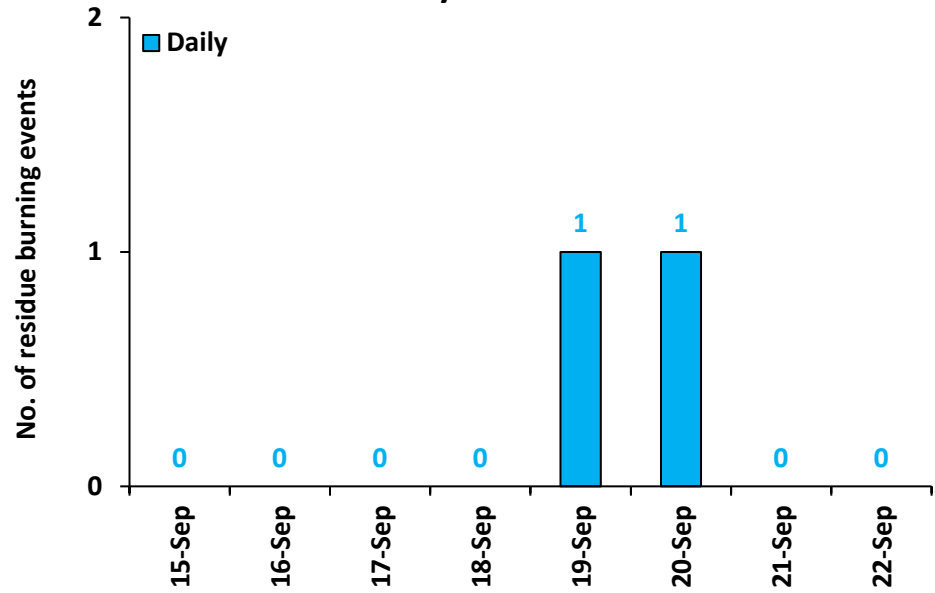
Uttar Pradesh



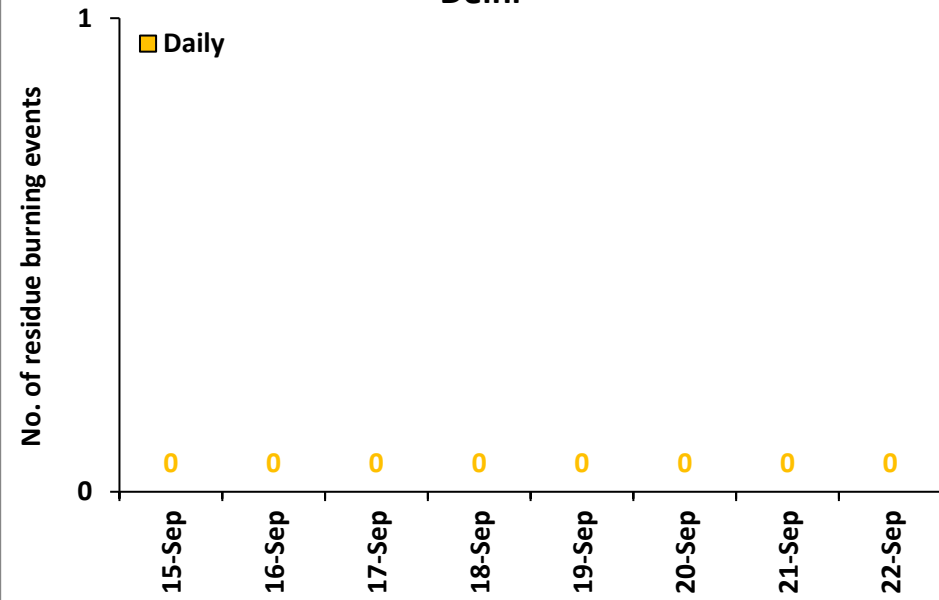
Rajasthan



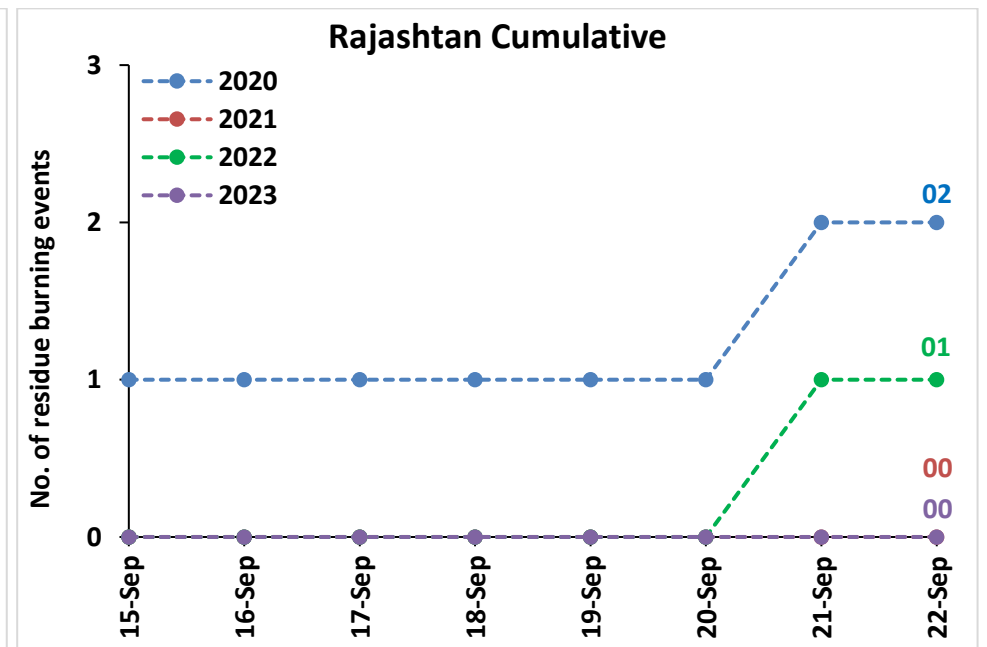
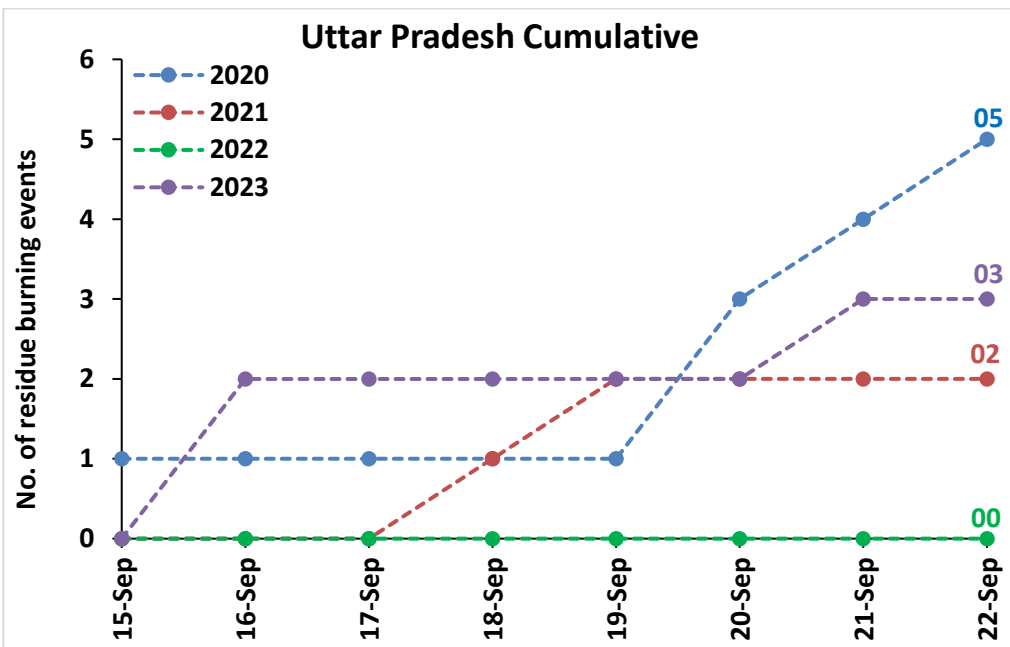
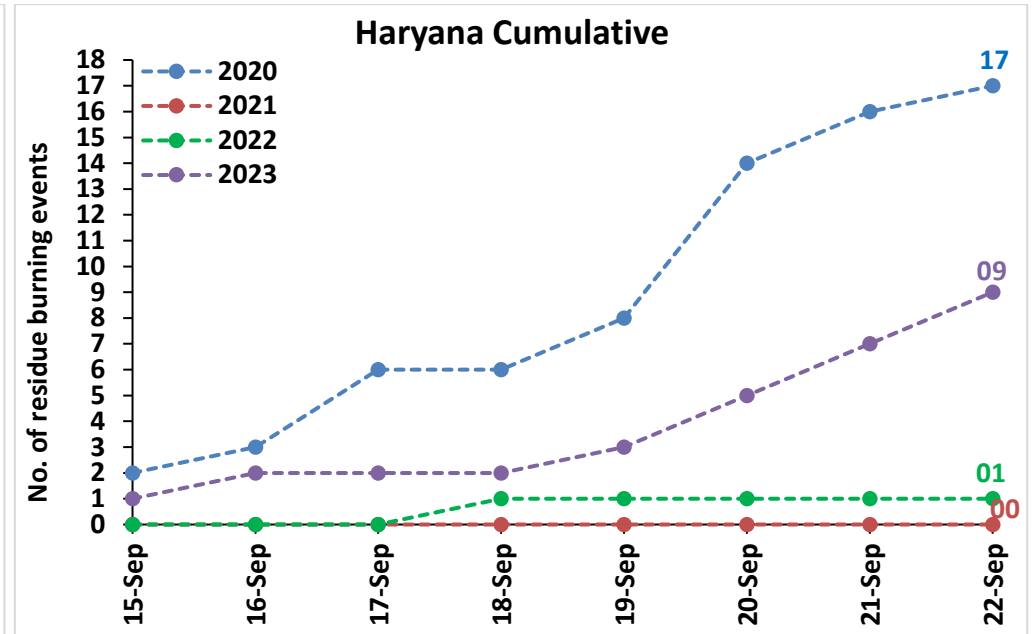
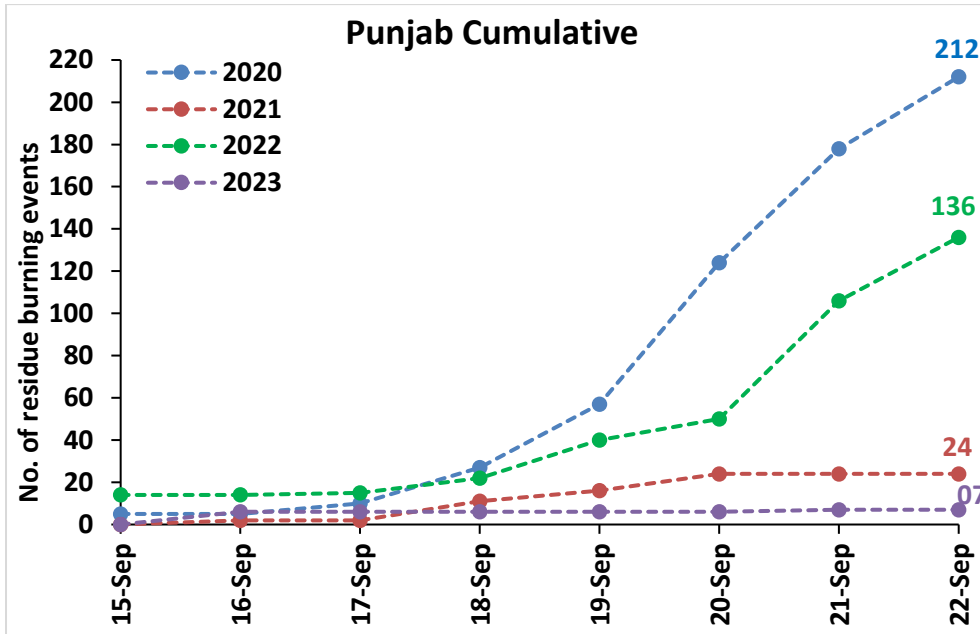
Madhya Pradesh



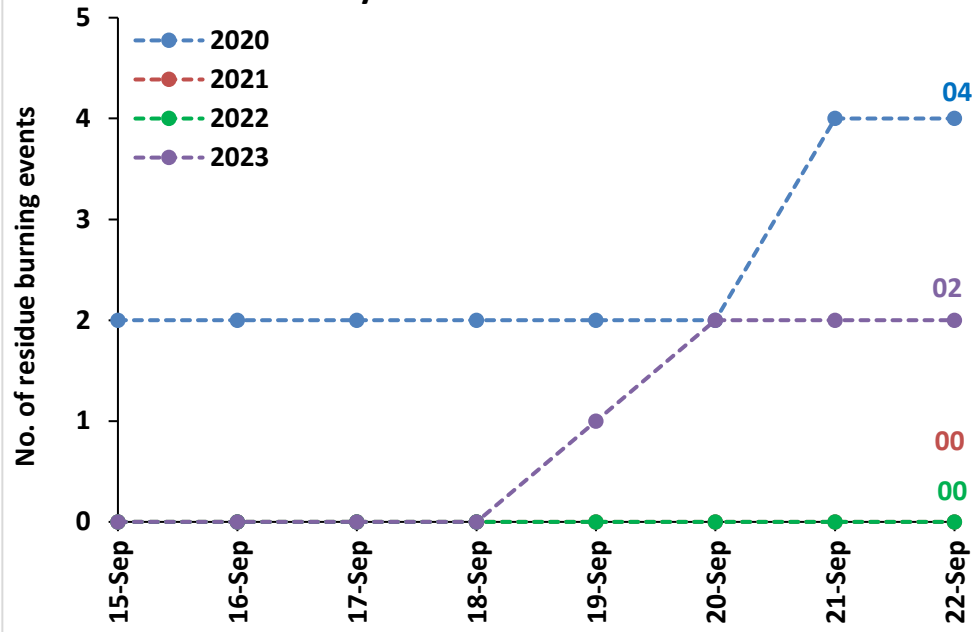
Delhi



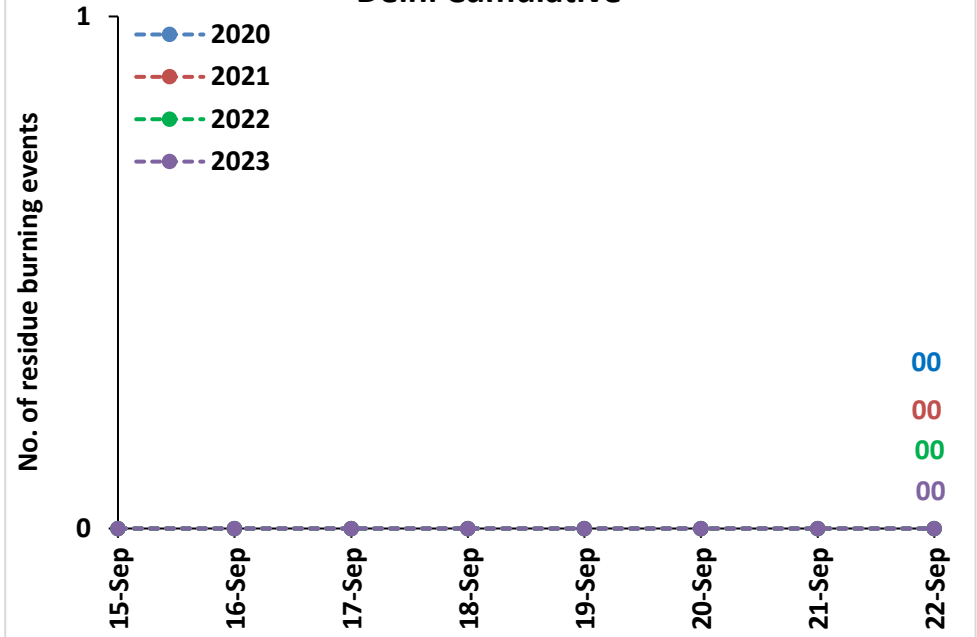
Comparison of residue burning events in current year (2023) with previous years (2020, 2021 and 2022) for the study States



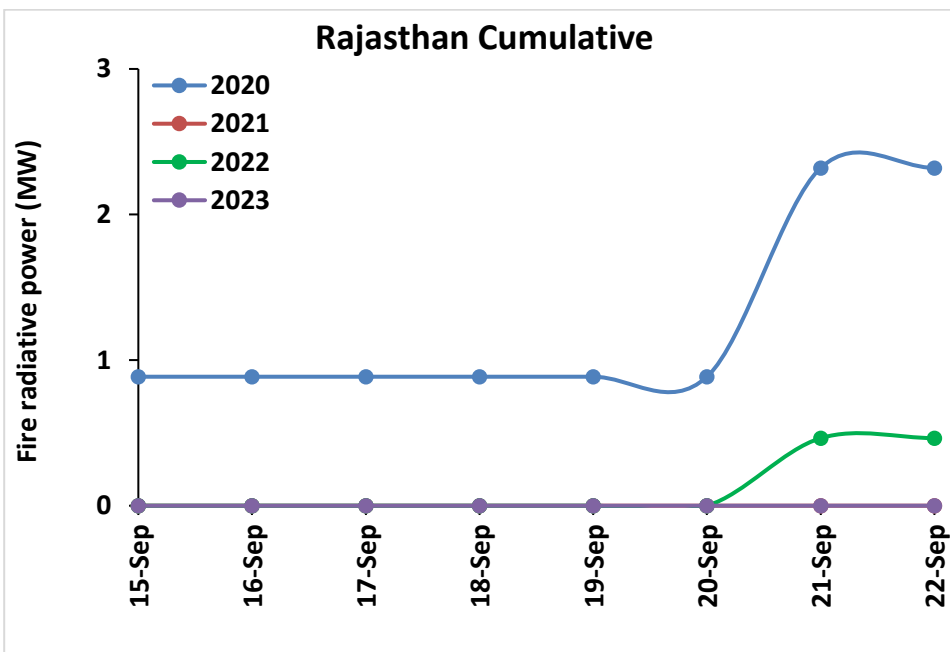
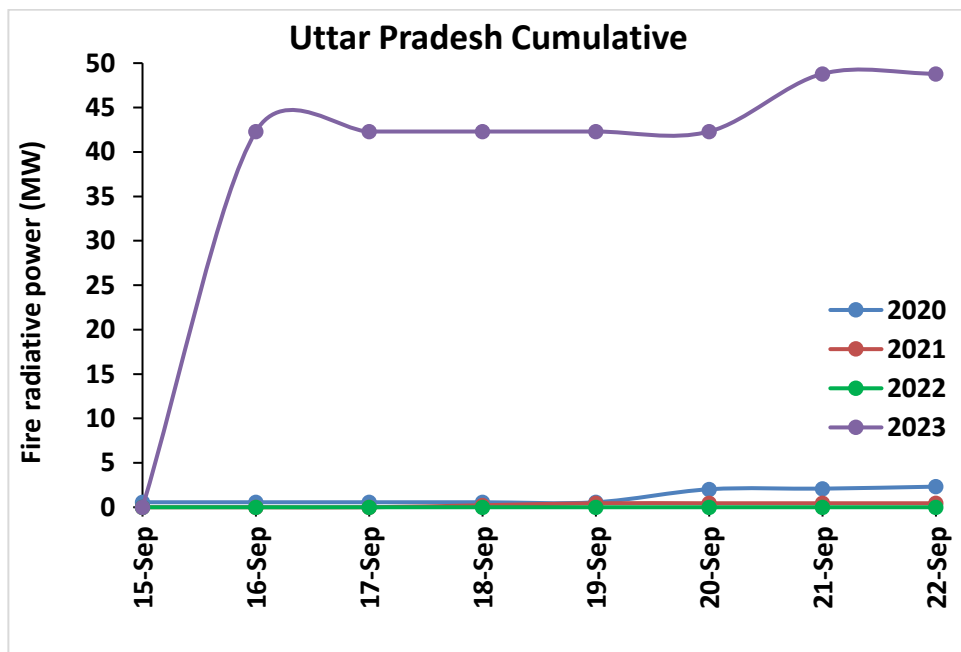
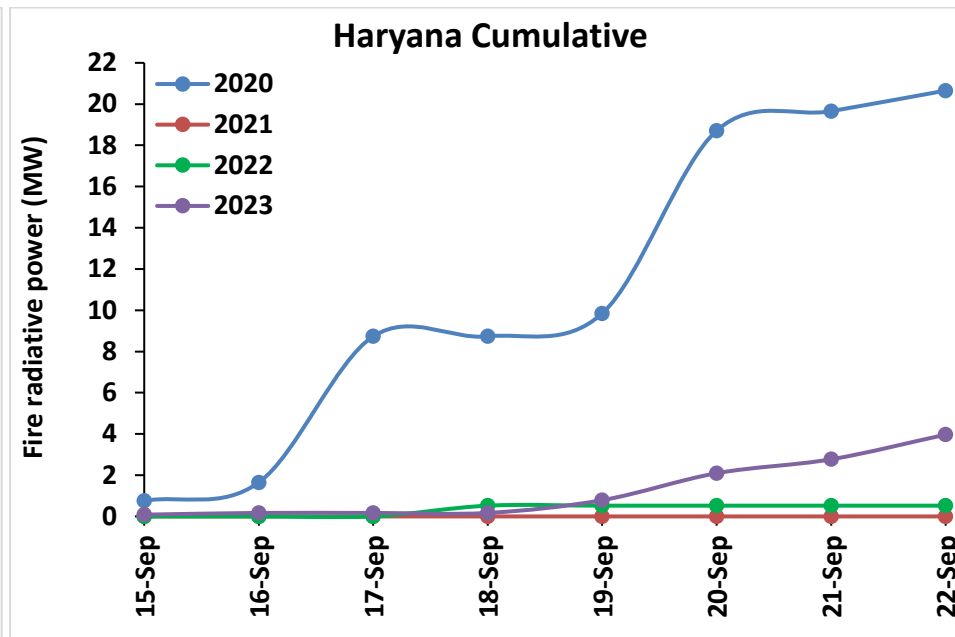
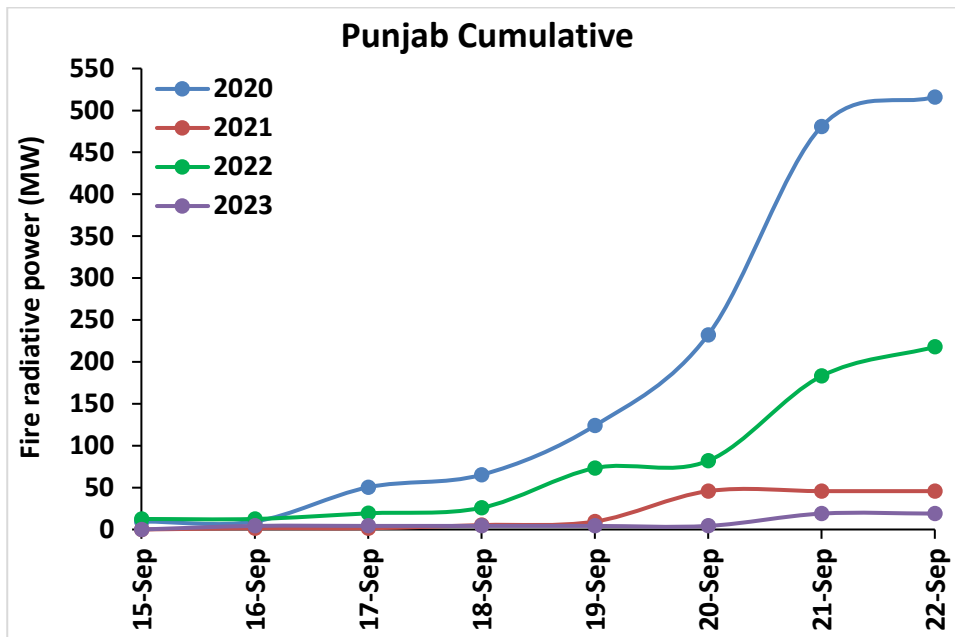
Madhya Pradesh Cumulative



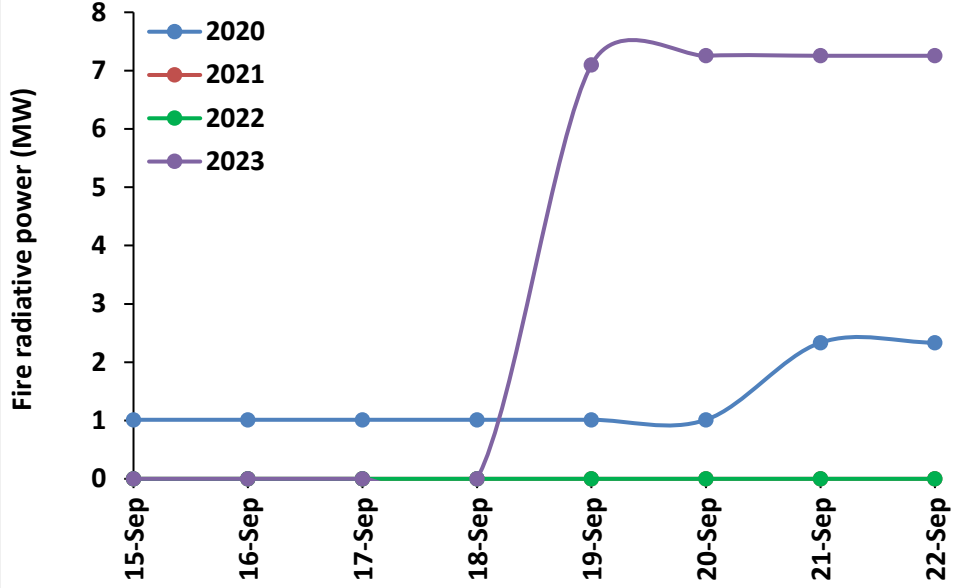
Delhi Cumulative



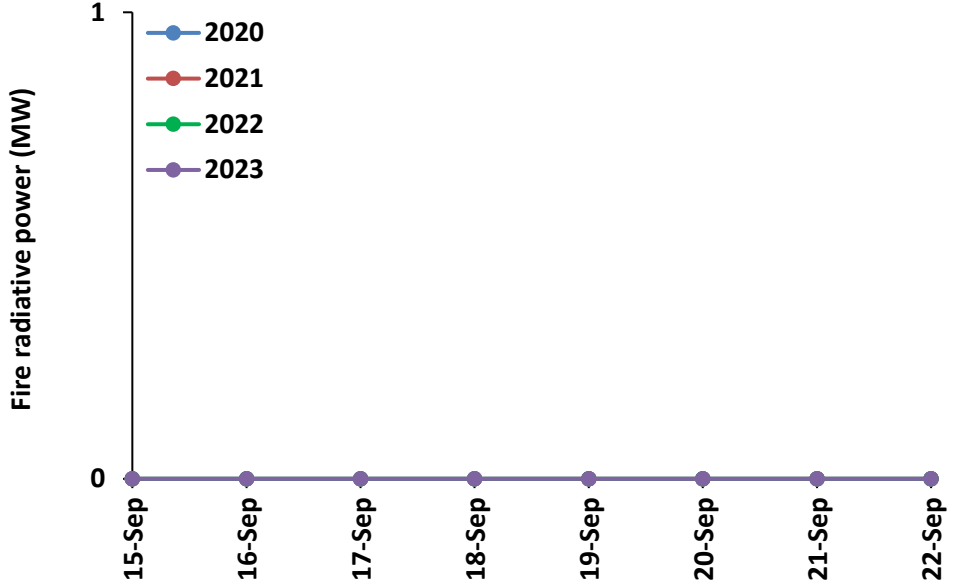
Comparison of residue burning fire power in current year (2023) with previous years (2020, 2021 and 2022) for the study States



Madhya Pradesh Cumulative

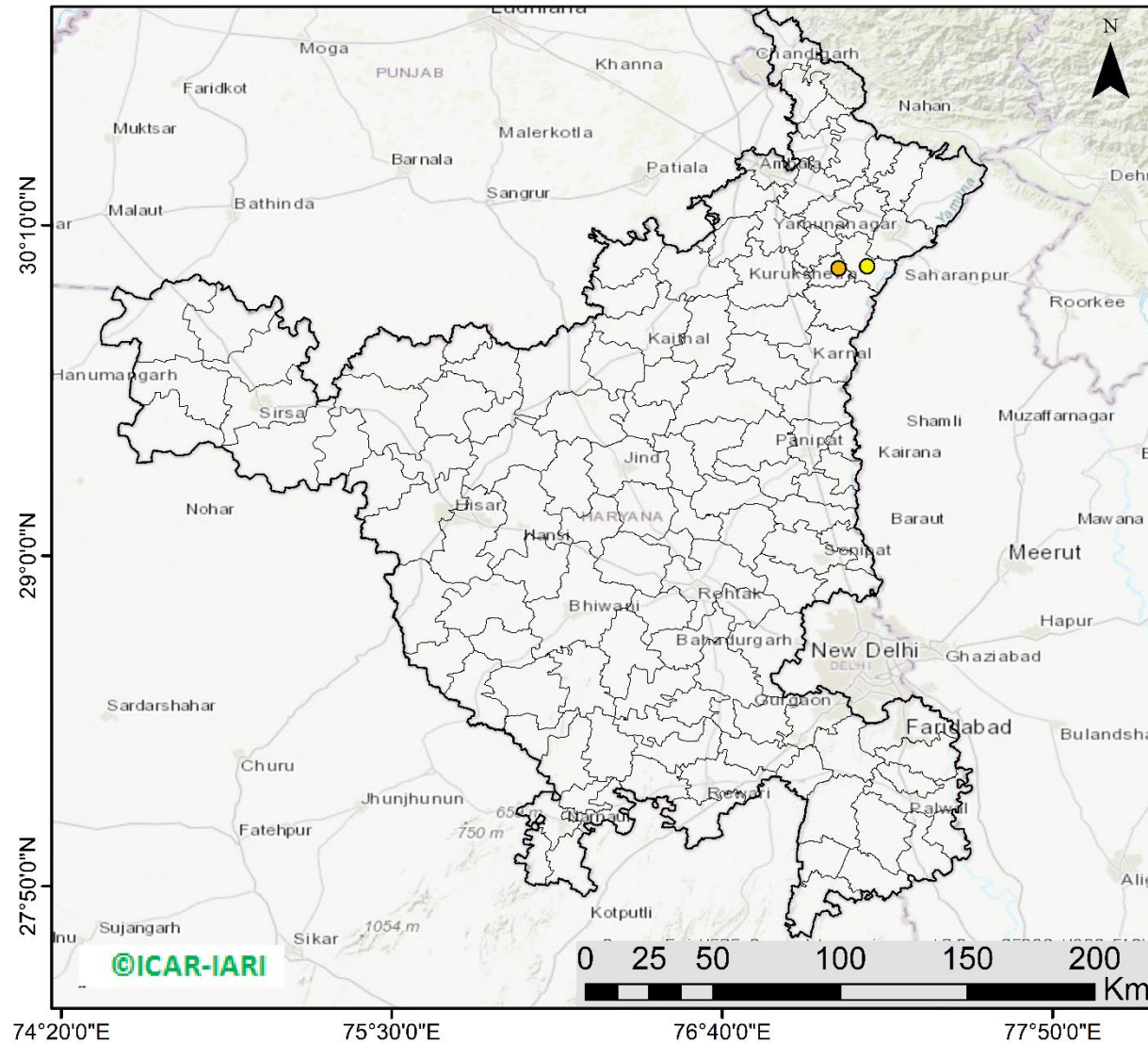


Delhi Cumulative



Haryana

RICE RESIDUE BURNING IN HARYANA



02 burning events detected in Haryana on (22nd Sep 2023)

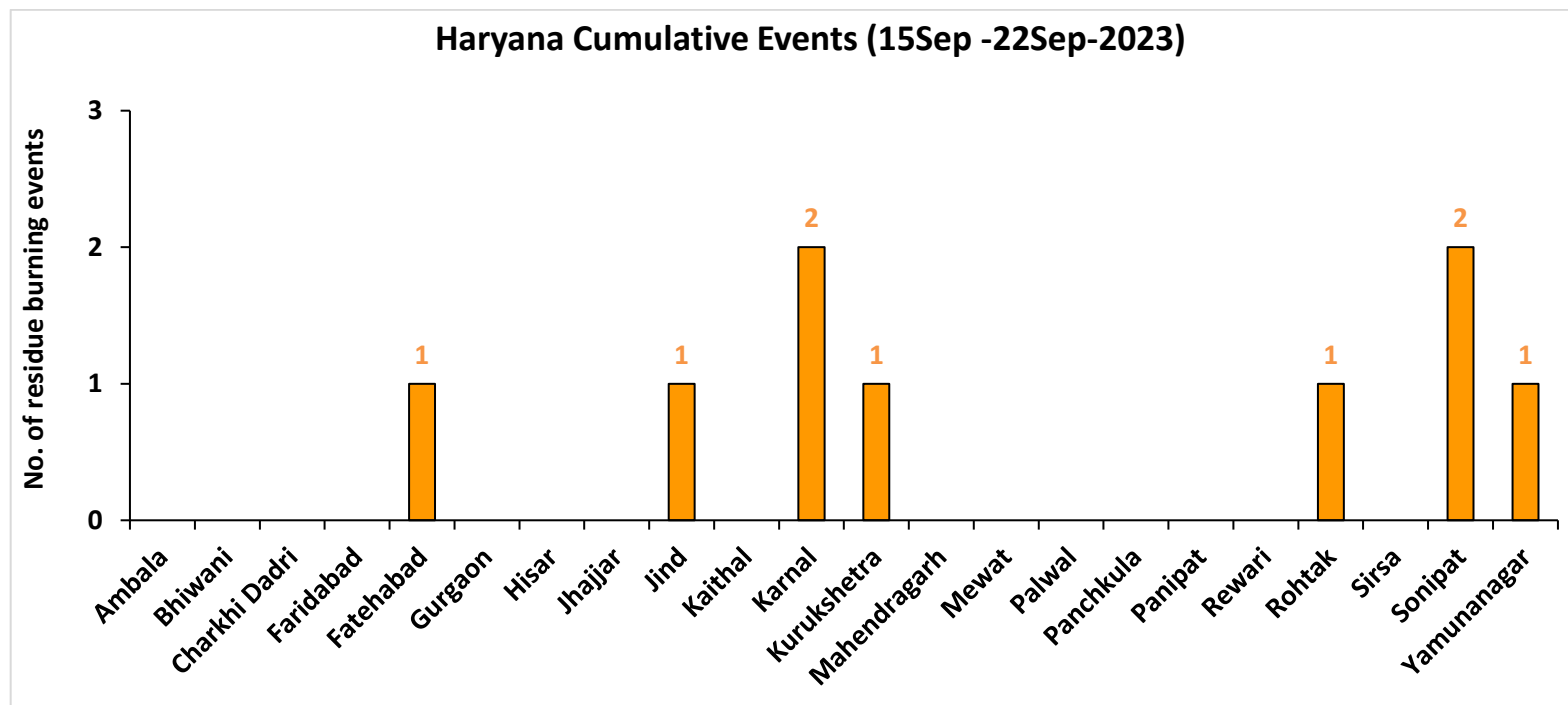
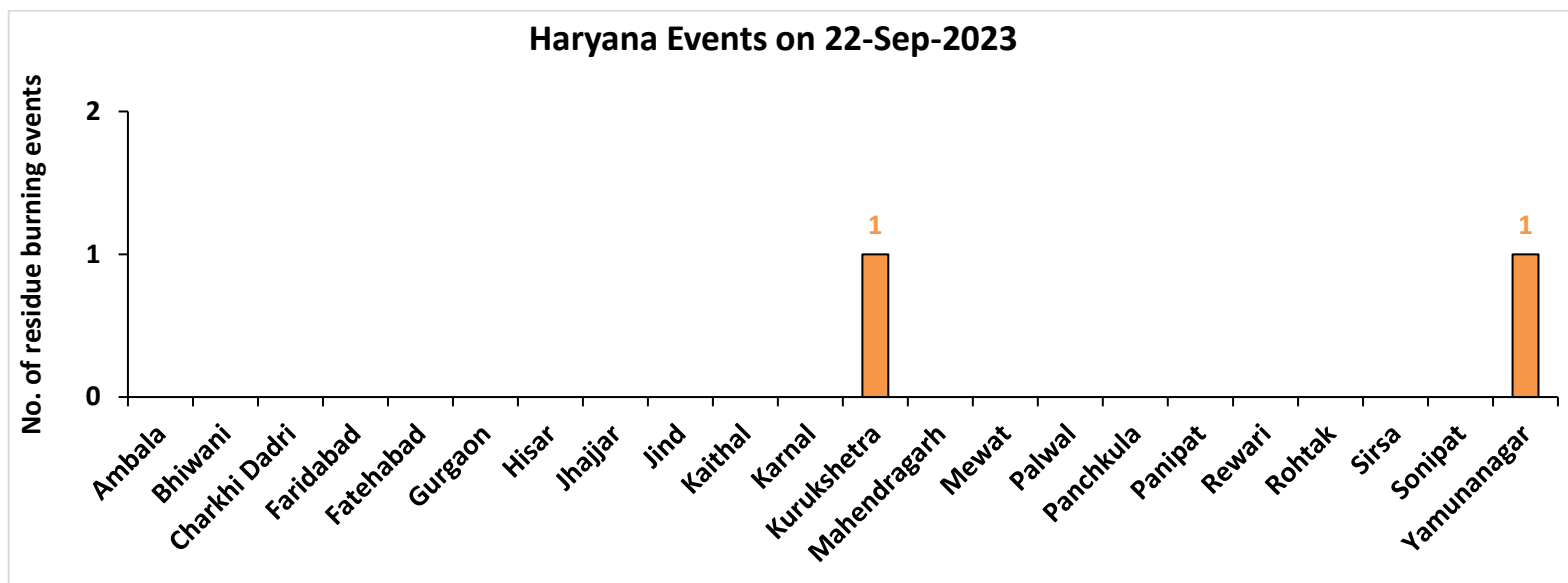
Fire Intensity (W/m²)

- 0 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- >20



<http://geoportal.icar.gov.in:8080/geoexplorer/composer/>

District-wise cumulative number of residues burning events in Haryana (15Sep-22Sep-2023)



District-wise cumulative number of residues burning events detected in 2020, 2021, 2022 and 2023
(Period: 15 September-22 September)

(a) Punjab

| District | 15 Sep-22 Sep | | | |
|--------------------|---------------|-----------|------------|----------|
| | 2020 | 2021 | 2022 | 2023 |
| Amritsar | 192 | 19 | 119 | 6 |
| Barnala | 0 | 0 | 0 | 0 |
| Bathinda | 0 | 0 | 0 | 0 |
| Faridkot | 0 | 1 | 0 | 0 |
| Fatehgarh Sahib | 0 | 0 | 0 | 0 |
| Fazilka | 0 | 0 | 0 | 0 |
| Firozpur | 0 | 0 | 0 | 0 |
| Gurdaspur | 1 | 0 | 1 | 0 |
| Hoshiarpur | 0 | 0 | 0 | 1 |
| Jalandhar | 0 | 0 | 0 | 0 |
| Kapurthala | 2 | 0 | 0 | 0 |
| Ludhiana | 3 | 0 | 0 | 0 |
| Mansa | 1 | 0 | 0 | 0 |
| Moga | 0 | 0 | 0 | 0 |
| Muktsar | 1 | 0 | 0 | 0 |
| Pathankot | 0 | 0 | 0 | 0 |
| Patiala | 0 | 3 | 1 | 0 |
| Rupnagar | 0 | 0 | 0 | 0 |
| Sangrur | 0 | 0 | 0 | 0 |
| SAS NAGAR (Mohali) | 3 | 0 | 1 | 0 |
| SBS Nagar | 0 | 0 | 1 | 0 |
| Tarn Taran | 9 | 1 | 13 | 0 |
| Total | 212 | 24 | 136 | 7 |

(b) Haryana

| District | 15 Sep-22 Sep | | | |
|---------------|---------------|----------|----------|----------|
| | 2020 | 2021 | 2022 | 2023 |
| AMBALA | 3 | 0 | 0 | 0 |
| BHIWANI | 0 | 0 | 0 | 0 |
| CHARKHI DADRI | 0 | 0 | 0 | 0 |
| FARIDABAD | 0 | 0 | 0 | 0 |
| FATEHABAD | 1 | 0 | 0 | 1 |
| GURGAON | 0 | 0 | 0 | 0 |
| HISAR | 0 | 0 | 0 | 0 |
| JHAJJAR | 0 | 0 | 0 | 0 |
| JIND | 0 | 0 | 1 | 1 |
| KAITHAL | 0 | 0 | 0 | 0 |
| KARNAL | 9 | 0 | 0 | 2 |
| KURUKSHETRA | 2 | 0 | 0 | 1 |
| MAHENDRAGARH | 0 | 0 | 0 | 0 |
| MEWAT | 0 | 0 | 0 | 0 |
| PALWAL | 0 | 0 | 0 | 0 |
| PANCHKULA | 0 | 0 | 0 | 0 |
| PANIPAT | 1 | 0 | 0 | 0 |
| REWARI | 0 | 0 | 0 | 0 |
| ROHTAK | 0 | 0 | 0 | 1 |
| SIRSA | 1 | 0 | 0 | 0 |
| SONIPAT | 0 | 0 | 0 | 2 |
| YAMUNANAGAR | 0 | 0 | 0 | 1 |
| Total | 17 | 0 | 1 | 9 |

(c) Uttar Pradesh

| District | 15 Sep-22 Sep | | | | | | | | | | | | | |
|---------------|---------------|------|------|------|-----------------|---|---|---|---|------------------|----------|----------|----------|----------|
| | 2020 | 2021 | 2022 | 2023 | GAUTAMBUDHNAGAR | 0 | 0 | 0 | 0 | MUZAFARNAGAR | 0 | 0 | 0 | 0 |
| AGRA | 0 | 0 | 0 | 0 | GAZIPUR | 0 | 0 | 0 | 0 | PILHIBHIT | 0 | 0 | 0 | 1 |
| ALIGARH | 0 | 0 | 0 | 0 | GHAZIABAD | 0 | 0 | 0 | 0 | PRATAPGARH | 0 | 0 | 0 | 0 |
| ALLAHABAD | 0 | 0 | 0 | 0 | GONDA | 0 | 0 | 0 | 0 | RAIBEARELI | 1 | 0 | 0 | 0 |
| AMBEDKARNAGAR | 0 | 0 | 0 | 0 | GORAKHPUR | 0 | 0 | 0 | 0 | RAMPUR | 0 | 1 | 0 | 0 |
| AMETHI | 0 | 0 | 0 | 0 | HAMIRPUR | 0 | 0 | 0 | 0 | SAMBHAL | 1 | 0 | 0 | 0 |
| AMROHA | 0 | 0 | 0 | 0 | HAPUR | 1 | 0 | 0 | 0 | SANTKABIRNAGAR | 0 | 0 | 0 | 0 |
| AURAIYA | 1 | 0 | 0 | 0 | HARDOI | 0 | 0 | 0 | 0 | SANTRAVIDASNAGAR | 0 | 0 | 0 | 0 |
| AZAMGARH | 0 | 0 | 0 | 0 | HATHRAS | 0 | 0 | 0 | 0 | SHAHJAHANPUR | 0 | 0 | 0 | 0 |
| BADAUN | 0 | 0 | 0 | 0 | JALAUN | 0 | 0 | 0 | 0 | SHAMLI | 1 | 0 | 0 | 0 |
| BAGHPAT | 0 | 0 | 0 | 0 | JAUNPUR | 0 | 0 | 0 | 0 | SHARANPUR | 0 | 0 | 0 | 0 |
| BAHRAICH | 0 | 0 | 0 | 0 | JHANSI | 0 | 0 | 0 | 0 | SHRAWASTI | 0 | 0 | 0 | 0 |
| BALLIA | 0 | 0 | 0 | 0 | KANNAUJ | 0 | 0 | 0 | 0 | SIDDHARTHANAGAR | 0 | 0 | 0 | 0 |
| BALRAMPUR | 0 | 0 | 0 | 0 | KANPUR | 0 | 1 | 0 | 0 | SITAPUR | 0 | 0 | 0 | 0 |
| BANDA | 0 | 0 | 0 | 0 | KANPUR DEHAT | 0 | 0 | 0 | 0 | SONBHADRA | 0 | 0 | 0 | 0 |
| BARABANKI | 0 | 0 | 0 | 0 | KASGANJ | 0 | 0 | 0 | 0 | SULTANPUR | 0 | 0 | 0 | 0 |
| BAREILLY | 0 | 0 | 0 | 0 | KAUSHAMBI | 0 | 0 | 0 | 0 | UNNAO | 0 | 0 | 0 | 0 |
| BASTI | 0 | 0 | 0 | 0 | KHERI | 0 | 0 | 0 | 0 | VARANASI | 0 | 0 | 0 | 0 |
| BIJNOR | 0 | 0 | 0 | 0 | KUSHINAGAR | 0 | 0 | 0 | 0 | Total | 5 | 2 | 0 | 3 |
| BULANSAHAR | 0 | 0 | 0 | 0 | LALITPUR | 0 | 0 | 0 | 0 | | | | | |
| CHANDAUJI | 0 | 0 | 0 | 0 | LUCKNOW | 0 | 0 | 0 | 0 | | | | | |
| CHITRAKOOT | 0 | 0 | 0 | 0 | MAHARAJGANJ | 0 | 0 | 0 | 0 | | | | | |
| DEORIA | 0 | 0 | 0 | 2 | MAHOBA | 0 | 0 | 0 | 0 | | | | | |
| ETAH | 0 | 0 | 0 | 0 | MAINPURI | 0 | 0 | 0 | 0 | | | | | |
| ETAWAH | 0 | 0 | 0 | 0 | MATHURA | 0 | 0 | 0 | 0 | | | | | |
| FAIZABAD | 0 | 0 | 0 | 0 | MAU | 0 | 0 | 0 | 0 | | | | | |
| FARRUKHABAD | 0 | 0 | 0 | 0 | MEERUT | 0 | 0 | 0 | 0 | | | | | |
| FATEHPUR | 0 | 0 | 0 | 0 | MIRZAPUR | 0 | 0 | 0 | 0 | | | | | |
| FIROZABAD | 0 | 0 | 0 | 0 | MORADABAD | 0 | 0 | 0 | 0 | | | | | |

(d) Delhi

| District | 15 Sep-22 Sep | | | |
|------------------|---------------|----------|----------|----------|
| | 2020 | 2021 | 2022 | 2023 |
| CENTRAL | 0 | 0 | 0 | 0 |
| EAST | 0 | 0 | 0 | 0 |
| NEW DELHI | 0 | 0 | 0 | 0 |
| NORTH | 0 | 0 | 0 | 0 |
| NORTH EAST | 0 | 0 | 0 | 0 |
| NORTH WEST DELHI | 0 | 0 | 0 | 0 |
| SHAHADRA | 0 | 0 | 0 | 0 |
| SOUTH | 0 | 0 | 0 | 0 |
| SOUTH EAST | 0 | 0 | 0 | 0 |
| SOUTH WEST DELHI | 0 | 0 | 0 | 0 |
| WEST DELHI | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | 0 |

(e) Rajasthan

| District | 15 Sep-22 Sep | | | |
|--------------|---------------|----------|----------|----------|
| | 2020 | 2021 | 2022 | 2023 |
| AJMER | 0 | 0 | 0 | 0 |
| ALWAR | 0 | 0 | 0 | 0 |
| BANSWARA | 0 | 0 | 0 | 0 |
| BARAN | 0 | 0 | 0 | 0 |
| BARMER | 0 | 0 | 0 | 0 |
| BHARATPUR | 0 | 0 | 0 | 0 |
| BHILWARA | 1 | 0 | 0 | 0 |
| BIKANER | 0 | 0 | 0 | 0 |
| BUNDI | 0 | 0 | 1 | 0 |
| CHITTAURGARH | 0 | 0 | 0 | 0 |
| CHURU | 0 | 0 | 0 | 0 |
| DAUSA | 0 | 0 | 0 | 0 |
| DHOLPUR | 0 | 0 | 0 | 0 |
| DUNGARPUR | 0 | 0 | 0 | 0 |
| GANGANAGAR | 0 | 0 | 0 | 0 |
| HANUMANGARH | 0 | 0 | 0 | 0 |
| JAIPUR | 0 | 0 | 0 | 0 |
| JAISELMER | 1 | 0 | 0 | 0 |
| JALOR | 0 | 0 | 0 | 0 |
| JHALAWAR | 0 | 0 | 0 | 0 |
| JHUNJHUNUN | 0 | 0 | 0 | 0 |
| JODHPUR | 0 | 0 | 0 | 0 |
| KARAULI | 0 | 0 | 0 | 0 |
| KOTA | 0 | 0 | 0 | 0 |
| NAGOUR | 0 | 0 | 0 | 0 |
| PALI | 0 | 0 | 0 | 0 |
| PRATAPGARH | 0 | 0 | 0 | 0 |
| RAJSMAND | 0 | 0 | 0 | 0 |
| SIKAR | 0 | 0 | 0 | 0 |
| SIROHI | 0 | 0 | 0 | 0 |
| SWAIMADHOPUR | 0 | 0 | 0 | 0 |
| TONK | 0 | 0 | 0 | 0 |
| UDAIPUR | 0 | 0 | 0 | 0 |
| Total | 2 | 0 | 1 | 0 |

(f) Madhya Pradesh

| District | 15 Sep-22 Sep | | | | | | | | |
|--------------|---------------|------|------|------|------------|---|---|---|---|
| | 2020 | 2021 | 2022 | 2023 | | | | | |
| | | | | | PANNA | 0 | 0 | 0 | 0 |
| ALIRAJPUR | 0 | 0 | 0 | 0 | RAISEN | 0 | 0 | 0 | 0 |
| ANUPPUR | 0 | 0 | 0 | 0 | RAJGARH | 0 | 0 | 0 | 0 |
| ASHOKNAGAR | 0 | 0 | 0 | 0 | RATLAM | 0 | 0 | 0 | 0 |
| BALAGHAT | 0 | 0 | 0 | 0 | REWA | 0 | 0 | 0 | 0 |
| BARWANI | 0 | 0 | 0 | 0 | SAGAR | 2 | 0 | 0 | 0 |
| BETUL | 0 | 0 | 0 | 0 | SATNA | 0 | 0 | 0 | 0 |
| BHIND | 0 | 0 | 0 | 0 | SEHORE | 0 | 0 | 0 | 0 |
| BHOPAL | 0 | 0 | 0 | 0 | SEONI | 0 | 0 | 0 | 0 |
| BURHANPUR | 0 | 0 | 0 | 0 | SHAHDOL | 0 | 0 | 0 | 0 |
| CHHATARPUR | 0 | 0 | 0 | 0 | SHAJAPUR | 0 | 0 | 0 | 0 |
| CHHINDWARA | 0 | 0 | 0 | 0 | SHEOPUR | 0 | 0 | 0 | 0 |
| DAMOH | 0 | 0 | 0 | 1 | SHIVPURI | 0 | 0 | 0 | 0 |
| DATIA | 0 | 0 | 0 | 0 | SIDHI | 0 | 0 | 0 | 0 |
| DEWAS | 0 | 0 | 0 | 0 | SINGRAULI | 0 | 0 | 0 | 0 |
| DHAR | 0 | 0 | 0 | 0 | TIKAMGARH | 0 | 0 | 0 | 0 |
| DINDORI | 0 | 0 | 0 | 0 | UJJAIN | 0 | 0 | 0 | 0 |
| EAST NIMAR | 0 | 0 | 0 | 0 | UMARIA | 0 | 0 | 0 | 0 |
| GUNA | 0 | 0 | 0 | 0 | VIDESHA | 0 | 0 | 0 | 0 |
| GWALIOR | 0 | 0 | 0 | 0 | WEST NIMAR | 0 | 0 | 0 | 0 |
| HARDA | 2 | 0 | 0 | 0 | Total | 4 | 0 | 0 | 2 |
| HOSHANGABAD | 0 | 0 | 0 | 1 | | | | | |
| INDORE | 0 | 0 | 0 | 0 | | | | | |
| JABALPUR | 0 | 0 | 0 | 0 | | | | | |
| JHABUA | 0 | 0 | 0 | 0 | | | | | |
| KATNI | 0 | 0 | 0 | 0 | | | | | |
| MANDLA | 0 | 0 | 0 | 0 | | | | | |
| MANDSAUR | 0 | 0 | 0 | 0 | | | | | |
| MORENA | 0 | 0 | 0 | 0 | | | | | |
| NARSHIMAPURA | 0 | 0 | 0 | 0 | | | | | |
| NIMACH | 0 | 0 | 0 | 0 | | | | | |

State-wise and date-wise number of paddy residue burning events detected in 2020 ,2021 ,2022 and 2023
(Period: 15 September-22 September)

Number of Paddy Residue Burning Events Detected

| Date | Punjab | | | | Haryana | | | | Uttar Pradesh | | | |
|--------------|------------|-----------|------------|----------|-----------|----------|----------|----------|---------------|----------|----------|----------|
| | 2020 | 2021 | 2022 | 2023 | 2020 | 2021 | 2022 | 2023 | 2020 | 2021 | 2022 | 2023 |
| 15-Sep | 5 | 0 | 14 | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 16-Sep | 0 | 2 | 0 | 6 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| 17-Sep | 5 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-Sep | 17 | 9 | 7 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 19-Sep | 30 | 5 | 18 | 0 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 20-Sep | 67 | 8 | 10 | 0 | 6 | 0 | 0 | 2 | 2 | 0 | 0 | 0 |
| 21-Sep | 54 | 0 | 56 | 1 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 1 |
| 22-Sep | 34 | 0 | 30 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 0 |
| Total | 212 | 24 | 136 | 7 | 17 | 0 | 1 | 9 | 5 | 2 | 0 | 3 |

Number of Paddy Residue Burning Events Detected

| Date | Delhi | | | | Rajasthan | | | | Madhya Pradesh | | | |
|--------------|----------|----------|----------|----------|-----------|----------|----------|----------|----------------|----------|----------|----------|
| | 2020 | 2021 | 2022 | 2023 | 2020 | 2021 | 2022 | 2023 | 2020 | 2021 | 2022 | 2023 |
| 15-Sep | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| 16-Sep | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17-Sep | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18-Sep | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19-Sep | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 20-Sep | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 21-Sep | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 0 |
| 22-Sep | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 4 | 0 | 0 | 2 |

Details of residue burning events in Haryana on 22-Sep-2023

| S. No. | District | Tehsil / Block | Satellite | Latitude | Longitude | ACQ_TIME | Day / Night | Fire Power (W/m ²) |
|--------|-------------|----------------|-----------|----------|-----------|----------|-------------|--------------------------------|
| 1 | KURUKSHETRA | LADWA | S-NPP | 30.01439 | 77.07817 | 14:06:58 | D | 5.60 |
| 2 | YAMUNANAGAR | RADAUR | S-NPP | 30.02139 | 77.17903 | 14:06:58 | D | 2.90 |

The study used data received from following Satellites at NRSC Ground Station

| S. No. | Satellite Name | Sensor | Resolution (meter) | Day / Night Passes |
|--------|----------------|--------|--------------------|--------------------|
| 1. | Suomi NPP | VIIRS | 375 / 750 | Both |
| 2. | Terra | MODIS | 1000 | Both |
| 3. | Aqua | MODIS | 1000 | Both |

**The rice mask for the Punjab and Haryana were provided by MNCFC, MoA&FW, Govt of India
The kharif crop mask for Delhi, Uttar Pradesh, Rajasthan and Madhya Pradesh were provided by NRSC (ISRO)**

Study Team

| | | | |
|--------------|-----------------------|----------------------------------|--|
| ICAR - IARI | Dr V.K. Sehgal | Pr. Scientist & Nodal Officer | iaricreams@gmail.com |
| | Dr Rajkumar Dhakar | Scientist | rajdhakar.iari@gmail.com |
| | Mr Mohd Jahangir | Lab Assistant (KRISHI) | mjahangir198@gmail.com |
| ICAR - ATARI | Dr Parvender Sheoran | Director ATARI (Zone-I) Ludhiana | zcu1ldh@gmail.com |
| | Dr. J.P. Mishra | Director ATARI (Zone-II) Jodhpur | jp.mishra67@gov.in |
| | Dr S.K. Dubey | Director ATARI (Zone-III) Kanpur | zpdicarkanpur@gmail.com |
| ICAR - IASRI | Dr Rajender Parsad | Director | rajender.parsad@icar.gov.in |

GIS Maps of fire events can be visualized online on ICAR KRISHI Geoportal website: <http://geoportal.icar.gov.in:8080/geoexplorer/composer/>
(Part of KRISHI Portal: <https://krishi.icar.gov.in> initiative)
