



Collection of Farm Fire Data in India

For Prelims: Consortium for Research on Agroecosystem Monitoring and Modeling from Space, Suomi NPP satellite, Moderate Resolution Imaging Spectroradiometer (MODIS), Visible Infrared Imaging Radiometer Suite, [Baler Machine](#), [Happy Seeder](#), [Bio-enzyme PUSA](#)

For Mains: Aspects Related to Data Collection of Farm Fires, Innovative Techniques for Crop-Residue Management.

[Source: IE](#)

Why in News?

As the [farm fire](#) season draws to a close, a total of **55,725** instances of such fires have been documented across six **North Indian States** from **September to November, 2023**.

- These figures have been attained **via [satellite surveillance](#)**, adhering to established and standardized monitoring protocols.

What are Farm Fires?

- Farm fires usually refer to deliberate fires set on agricultural fields, primarily after the **harvest season to clear [crop residue](#)**, particularly in regions practicing stubble burning.
 - These fires often involve **burning leftover straw, stubble, or crop residues** to prepare fields for the next planting season quickly.
 - **However, farm fires** can also **occur accidentally due to machinery malfunctions** or other unintended causes.
- While it can be a cost-effective and time-saving method for farmers, **it contributes significantly to air pollution**, emitting large amounts of **smoke, [particulate matter](#), and [greenhouse gases](#) into the atmosphere**.

What are the Major Aspects Related to Data Collection of Farm Fires?

- **Data Collection Body:**
 - [Indian Agricultural Research Institute's \(IARI\) Consortium for Research on Agroecosystem Monitoring and Modeling from Space \(CREAMS\)](#) Laboratory issues a daily report on **paddy residue fires**.
 - It was set up in **2013**, with the primary purpose of **monitoring crop conditions against extreme climatic events**.
 - This comprehensive bulletin details farm fire incidents in **Punjab, Haryana, Uttar Pradesh, Rajasthan, Madhya Pradesh, and Delhi**.
 - It includes a **district-wise breakdown** of recorded incidents from 2020 onwards,

specifying fire location, satellite used, timestamp, and intensity.

- The report is shared with central and state-level agencies, to guide actions and **identify hotspots needing focused interventions.**

▪ **Data Collection Through Satellites:**

- Three sensors aboard three different NASA satellites: **one called [Visible Infrared Imaging Radiometer Suite \(VIIRS\)](#) aboard the **Suomi NPP satellite**, and **two called Moderate Resolution Imaging Spectroradiometer (MODIS)**, aboard the **Terra and Aqua satellites**, collect this data by recording land surface temperatures.
 - Each satellite passes over the **Indian subcontinent twice every 24 hours**, at different times.**
- In the past five years, the lab has used a different satellite set to map burned areas. [Sentinel-2 satellites](#), **part of the European Space Agency**, serve this purpose.

▪ **Monitoring Protocol:**

- IARI acquires satellite data from its ground station and the [National Remote Sensing Centre](#), ensuring year-round monitoring of farm fires across the country.
- Prior to **2021**, varied methodologies led to discrepancies in **recorded farm fire** events across different monitoring centers.
- However, the [Commission for Air Quality Management](#) implemented a **standardized protocol in 2021**.
 - IARI reprocessed 2020 data using this protocol, enabling comparative analysis from 2020 onward.

▪ **Identifying Paddy Fires:**

- Identifying paddy fires involves **distinguishing them from forest fires** or those originating from industries.
 - This process begins by **identifying paddy cultivation areas** and mapping farm fires accordingly.
 - Paddy cultivation exhibits a **distinct reflectance signature** over time due to its **typical background of water**, unlike other crops like sugarcane or maize. Overlaying this signature with fire events helps discern paddy fires.
- Satellites determine **active paddy fires by detecting an increase in land surface temperature above specific thresholds**, distinguishing fire events from surroundings.

Note

Detecting a fire **relies more on the quantity of burnt residue** than the area affected. A higher amount of residue burnt results in a notable increase in temperature compared to the surroundings, **indicating greater fire intensity and the likelihood of detection.**

- **Fire intensity**, measured as energy emitted per unit area and time, offers insights into the quantity of residue burnt.
- **Limitations and Challenges**
 - **Weather Influence:** Climatic conditions, particularly **cloud cover and water vapor**, can obstruct satellite sensors, hindering accurate readings and data acquisition.
 - **Seasonal and Time-of-Day Variability:** Changes in seasons and **discrepancies between day and night conditions** affect the effectiveness of fire detection thresholds, creating hurdles for consistent monitoring.

What are the Innovative Techniques for Crop-Residue Management?

- [Baler Machine](#)
- [Happy Seeder](#)
- [Bio-enzyme PUSA](#)

Conclusion

Understanding the complexities and limitations of data collection is crucial in **devising effective strategies to address farm fires and mitigate their impact on environmental and public health concerns**. Continual advancements in technology and methodology remain integral to refining monitoring approaches for better insights and proactive interventions.

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