

Why do Pakistani Farmers Burn Crop Residue and what can be the Solutions?

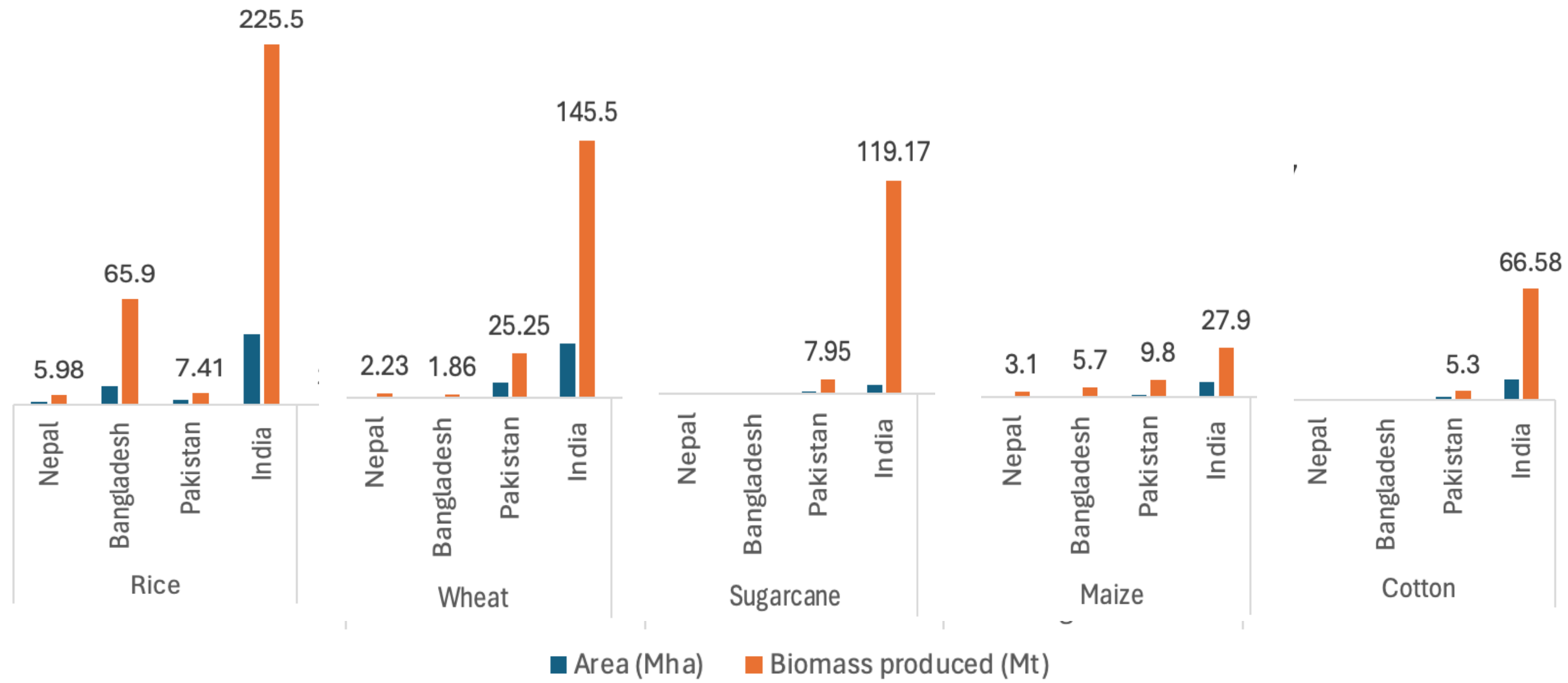
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Where do residues come from?



Crop residue burning in Pakistan



20% of crop residues on average are used sustainably



Why burn?



Harvest methods leaving extra stalk in fields

- Increasing use of combine harvesters that leaves longer stalks

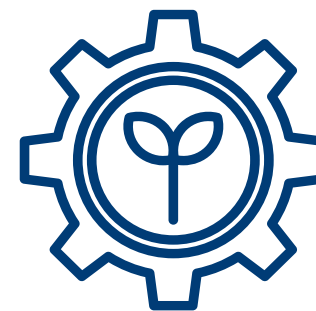
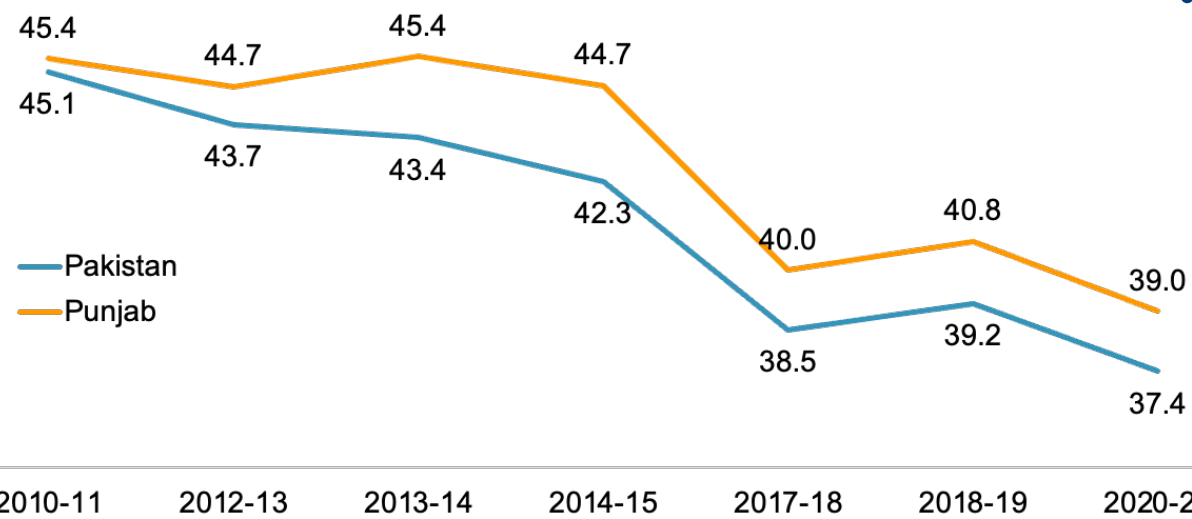


Tight seeding schedule

Reasons

Lack of resources & high labor cost

% Population engaged in agriculture sector



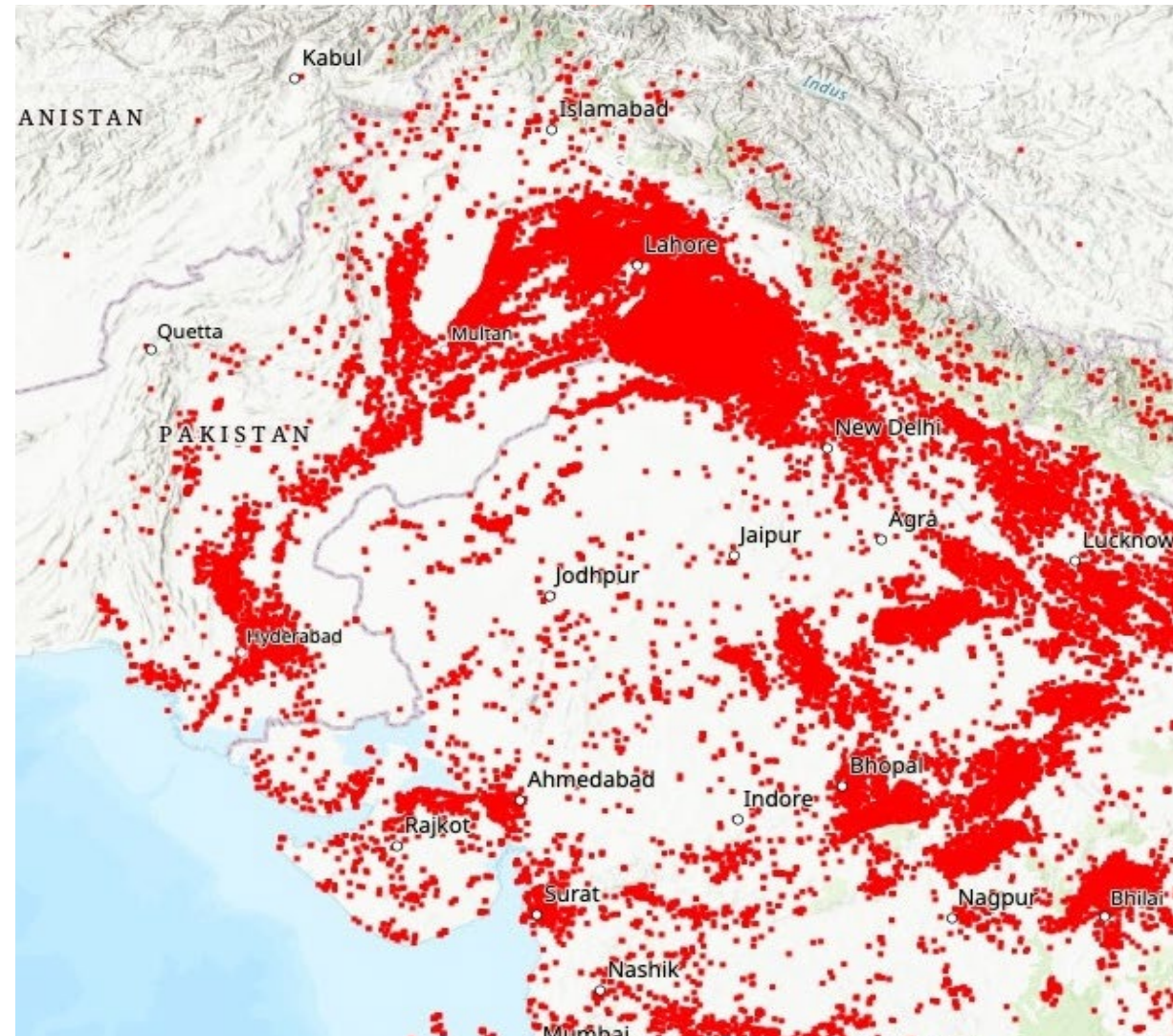
Poor access to equipment / machinery

- Lack of appropriate machinery for straw collection
- Less availability of balers, choppers, low-till seeders

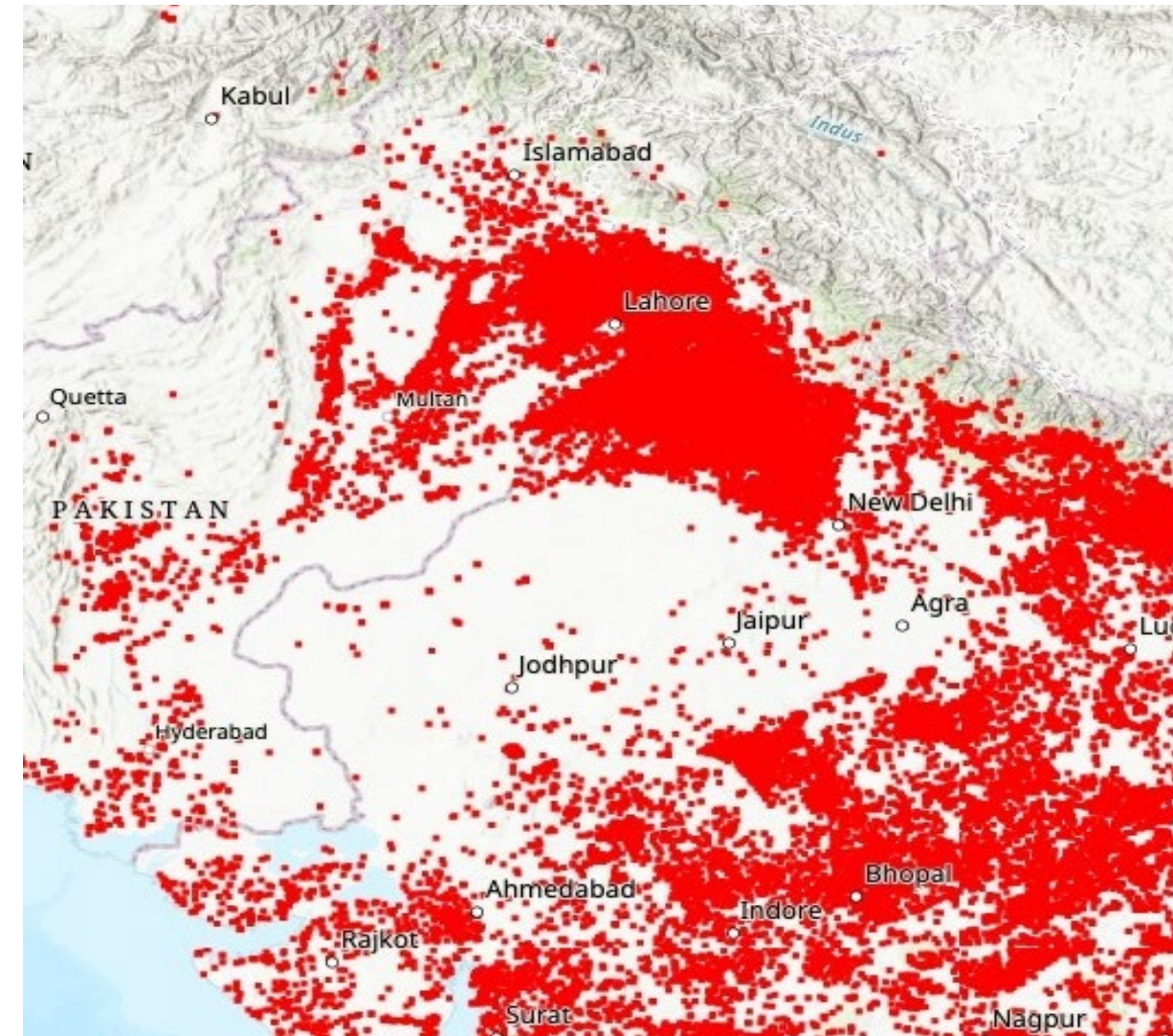
Fire hotspots and frequency across Pakistan



- **Wheat-Rice** cropping system in Pakistan generates surplus residue



November 2023



May 2023

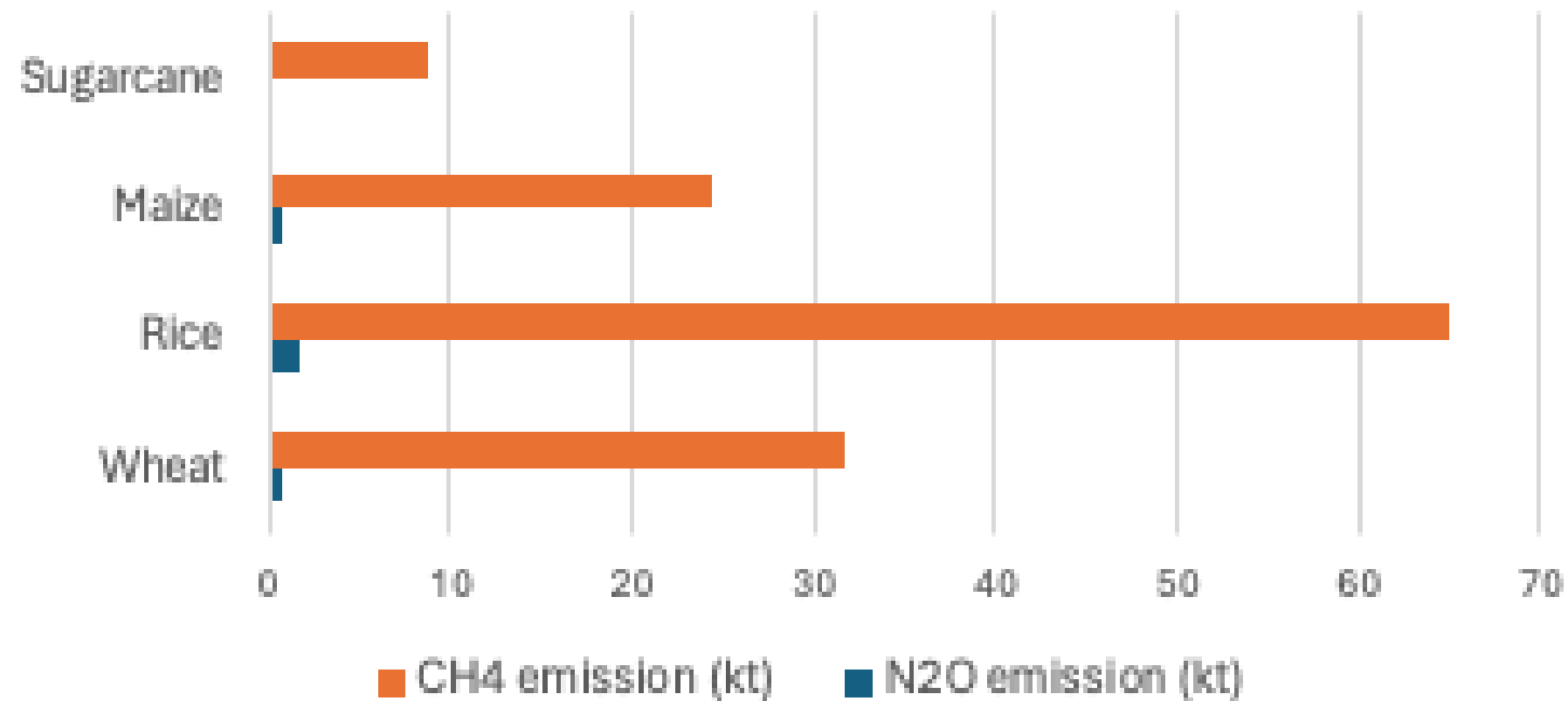
Satellite data of fire hotspots show highest frequency during the months of May (wheat harvest) and November (rice harvest)

- Over 80,000 hectare area burnt in kharif & 40,000 hectares in rabi in Pakistan Punjab

Impact of residue burning



Nitrous Oxide & Methane emissions from residue burning (India - 2019)



- **Open burning** of crop residues emit **nitrous oxide** & **black carbon**, leading to high particulate matter (**PM**) in the air that causes **smog**
- Black carbon has contributed **more than 50 percent** of accelerated glacial melting worldwide in recent decades
 - Also **modifies rainfall** patterns

Source: World Bank (2024) Towards Clean Air in Punjab

UNESCAP Sustainable Management of Crop Residues in Bangladesh, India, Nepal and Pakistan (2023)

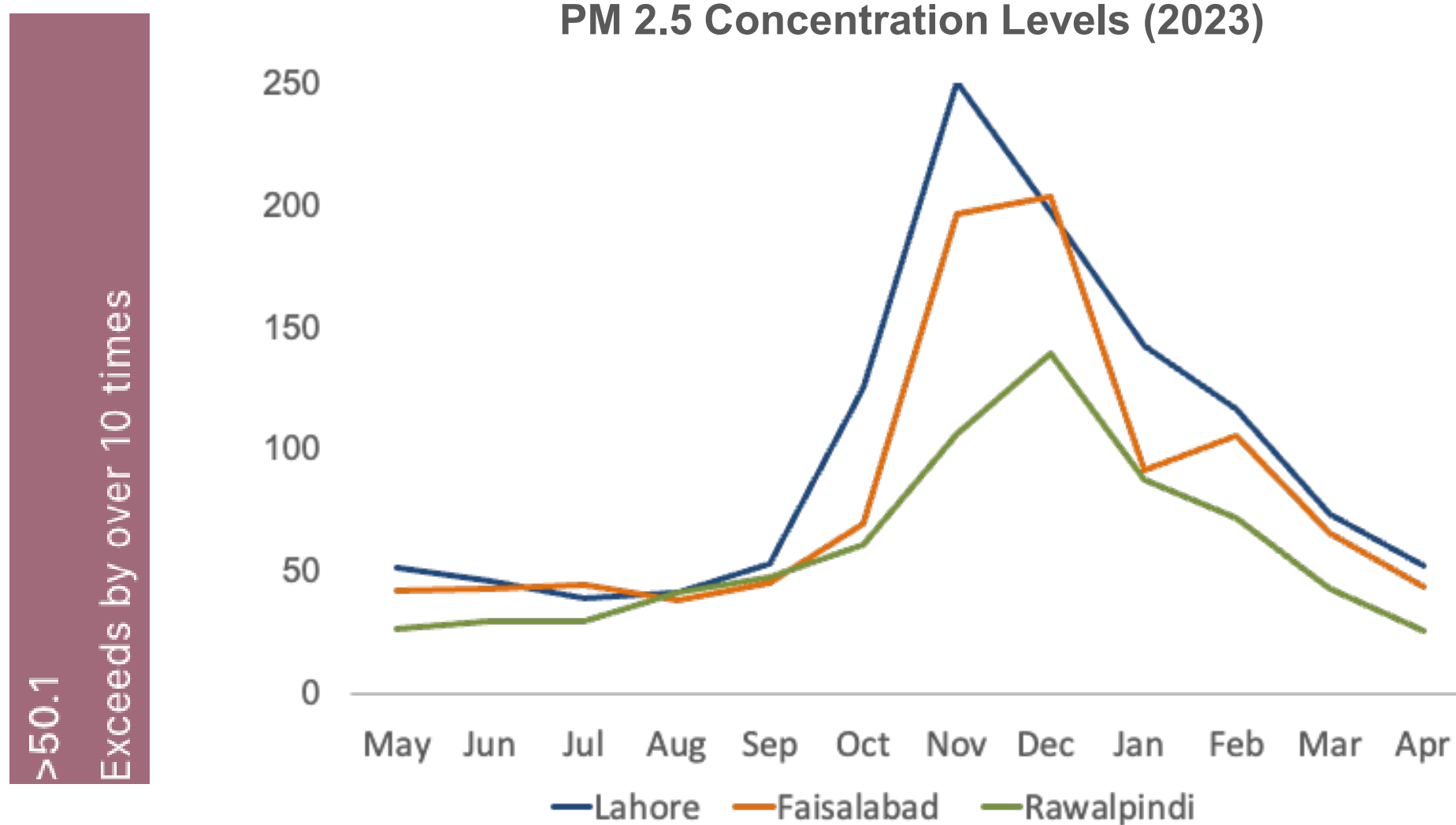
[https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1896766#:~:text=The%20total%20greenhouse%20gas%20\(GHG,world%20with%20its%20food%20exports.](https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1896766#:~:text=The%20total%20greenhouse%20gas%20(GHG,world%20with%20its%20food%20exports.)

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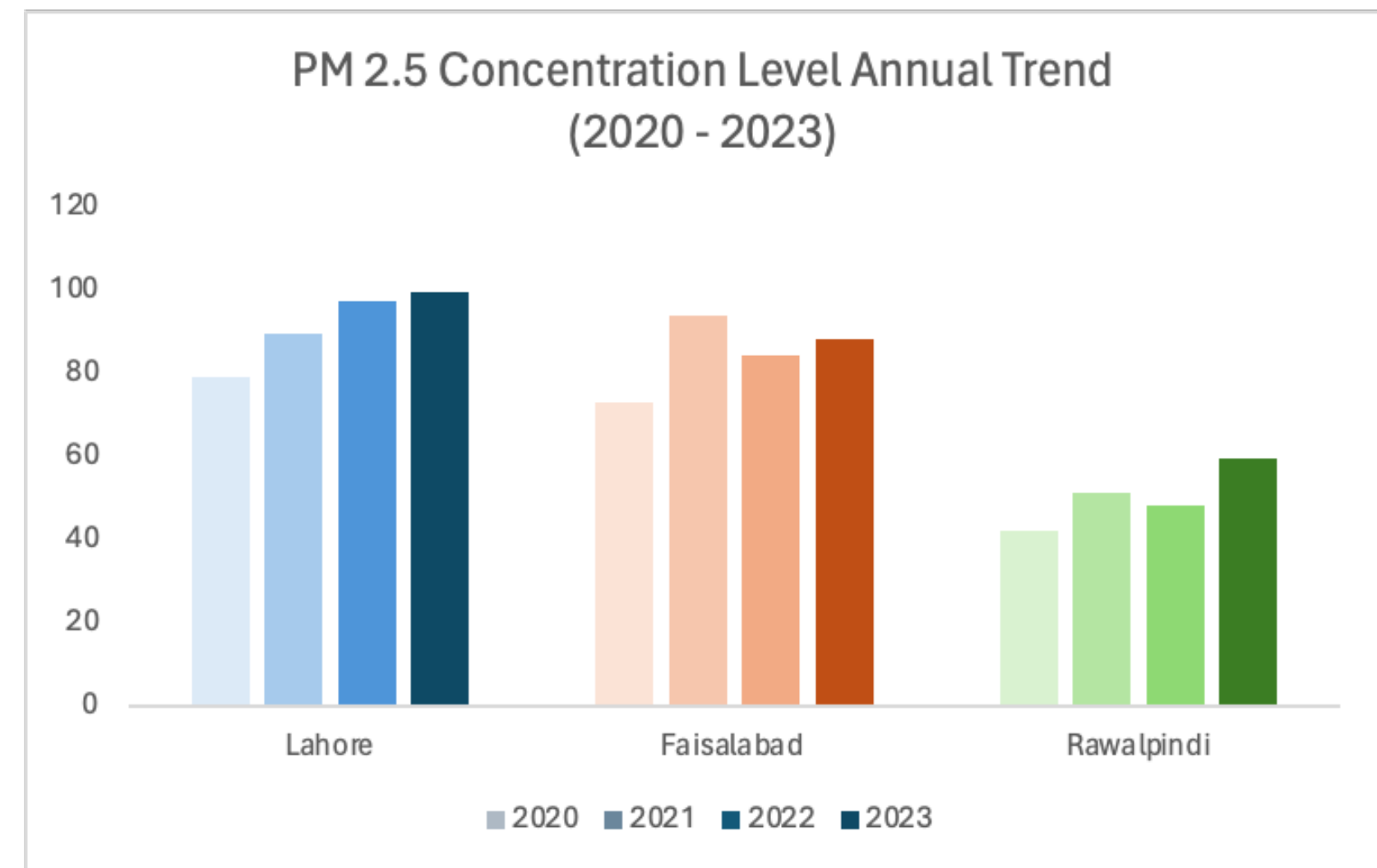
Air quality of cities in Pakistan



- In 2023, Pakistan ranked **2nd** in the list of countries with worst air quality
- **6 of 10** most polluted cities in Pakistan are in Punjab
- There were only **17 'good' Air Quality Index (AQI)** days out of the total 309 monitored days in Lahore



>50.1
Exceeds by over 10 times



[1] AQI Index <https://www.iqair.com/world-air-quality>

[2] Punjab EPD State of Environment Report for 2022. The AQI translates the highest observed value of 7 pollutants/metrics (8-hr and 1-hr ozone, PM2.5, PM10, CO, SO2 and NO2) on a scale of 1-500.

[3] Punjab EPCCD, State of Environment Report 2022.

Welfare cost of air pollution



Globally, current levels of air pollution reduces 2.2 years of life expectancy

- **4.3 years of life on average** in Pakistan

Welfare costs of air pollution is estimated at nearly **9 percent of GDP** in Pakistan, measured by the societal value of premature deaths and of years lost to disability

The estimated cost of improving air quality to meet the **WHO guideline value** is the equivalent of about **0.6 percent of Punjab's GDP**



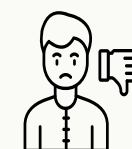
Closure of
schools
and offices



Less
Tourism



Low food
productivity
(emissions penetrate
plant structures)



Poor Quality
of Life

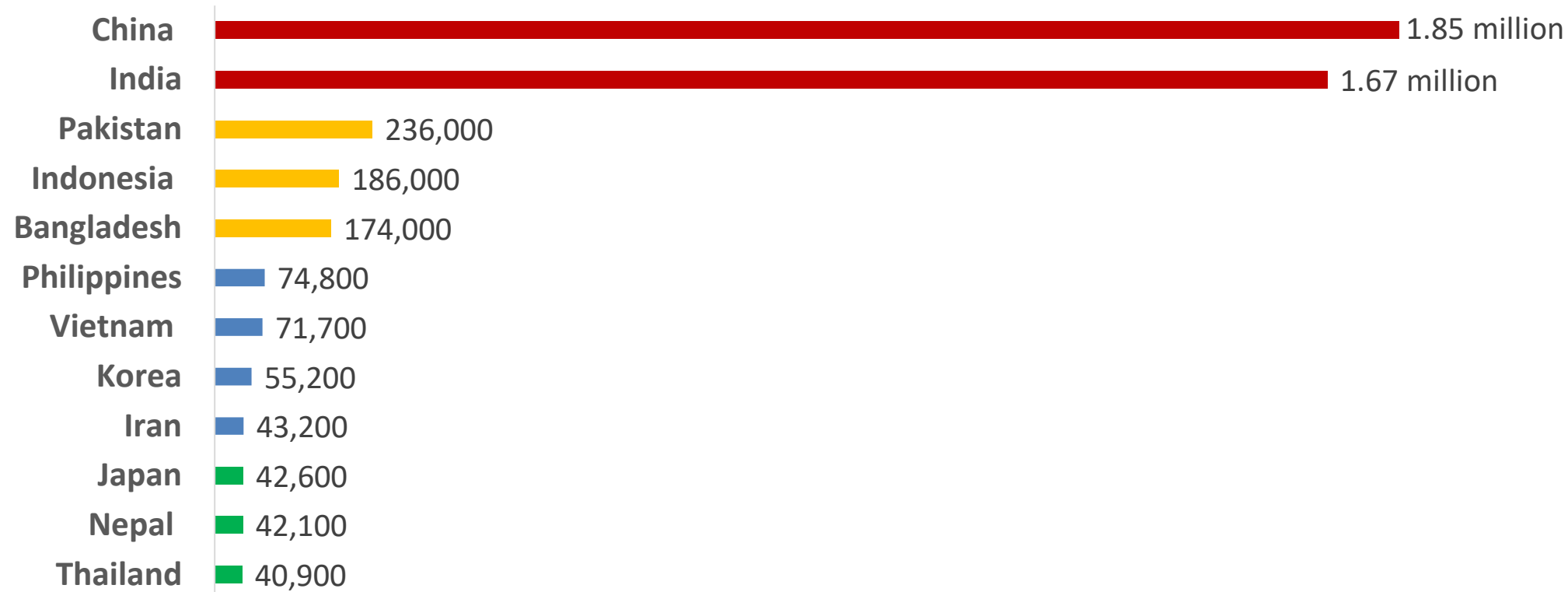
[1] World Bank 2021. The Global Health Cost of PM2.5 Air Pollution: A Case for Action Beyond 2021, Washington DC. The value of mortality is estimated based on revealed preference methods to determine the value of a statistical life. The value of morbidity is estimated based on both the cost of illness and the direct labor productivity losses.

[2] World Bank (2024) Towards clean air in Punjab

Potential loss



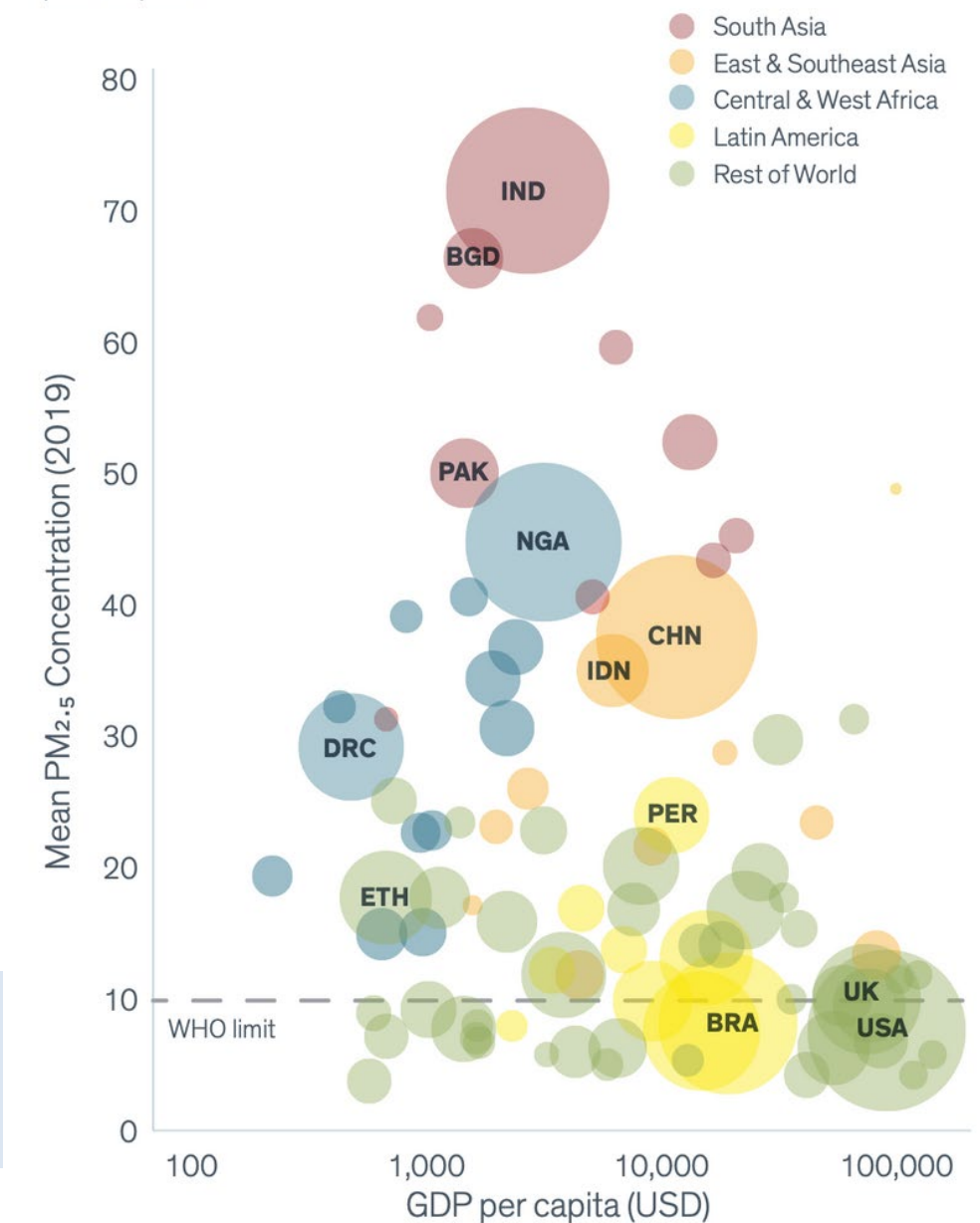
Deaths due to air pollution in 2019



- **7 million** deaths each year globally due to air pollution

OECD projects ~1% GDP loss in South Asian countries due to agriculture losses, health expenses and lost labor productivity

PM concentrations and GDP per capita (2019)



Source: UNESCAP (2022) Air Pollution and GHG Emissions from the Agricultural Sector in South and Southeast Asia; World Bank (2021);

ADB (2022) Air Quality in Asia: Why is it important and what can we do?;

Air Quality Life Index (2021) Annual Update (<https://aqli.epic.uchicago.edu/>)

What can be done?

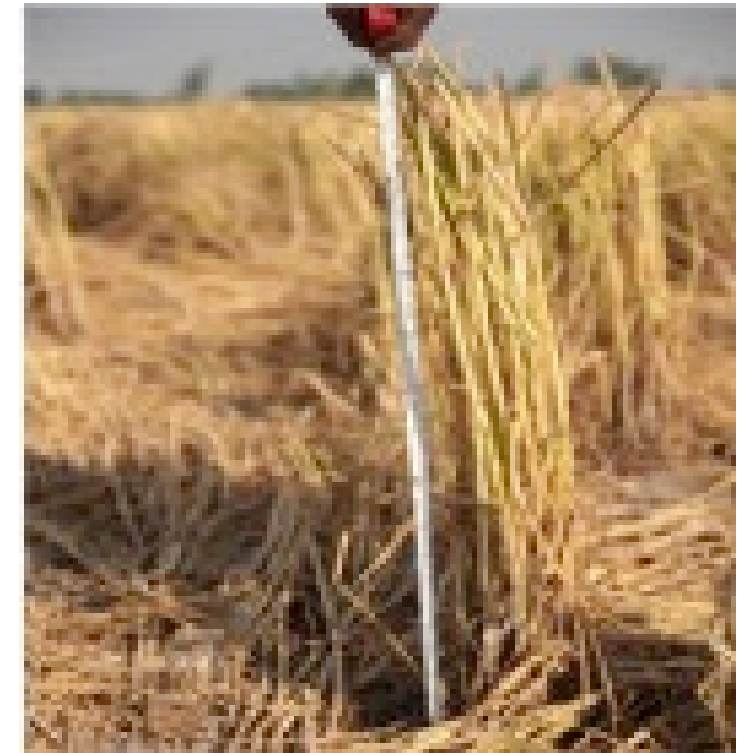


2. Introduce machinery standards and testing

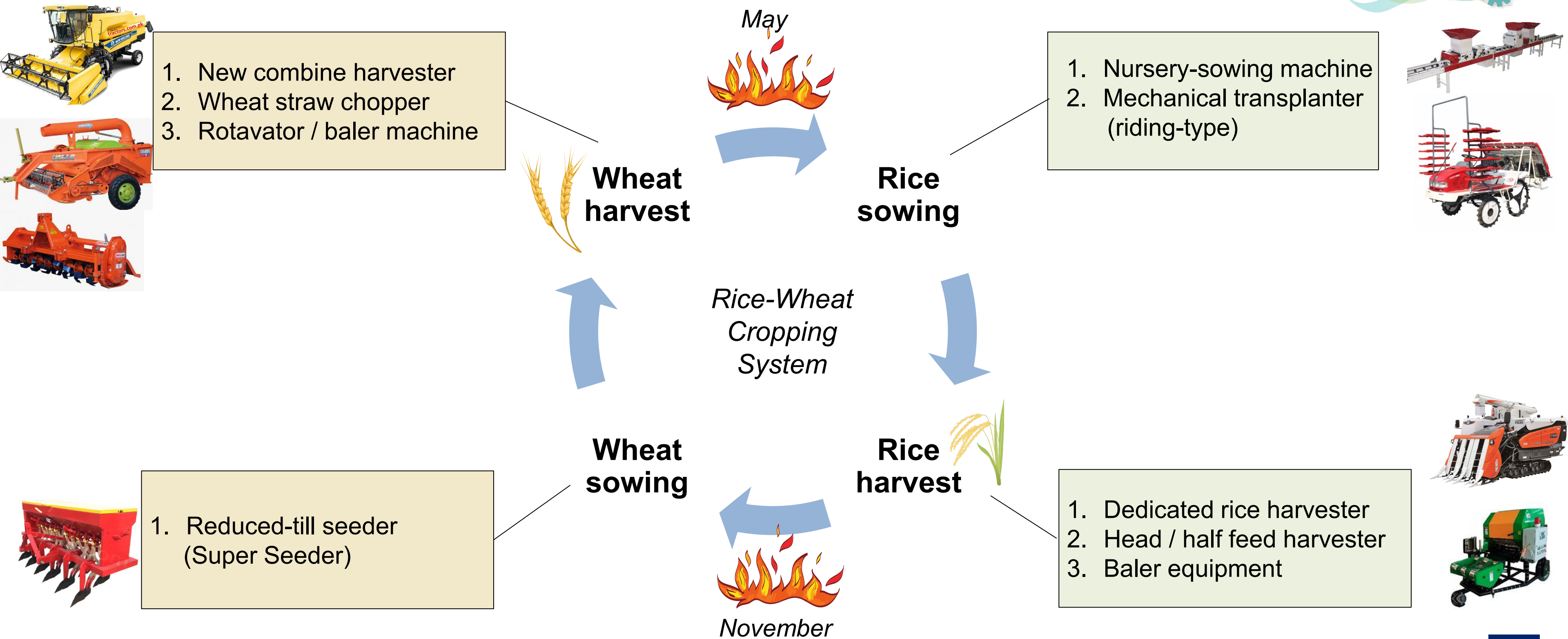


Scale-up **access** and **availability** of machinery for efficient residue management:

1. Strengthen agriculture mechanization through **provision** of climate smart and advanced agricultural machines to **service providers**
2. Field **demonstrations** to increase farmers' awareness about the efficient use of climate smart and advanced agricultural machineries, with **good farming practices** and strengthening **air quality management** in crop field



1. Sustainable mechanization



2. Introduce machinery standards and testing



- **Local manufacturing of farm implements / machinery is increasing, but without standards, testing and performance evaluation**
 - **Poor quality machines result in harvest & yield losses and loss of farmer confidence in machinery**

ADB, with technical support of **ANTAM** proposes:

- Pakistan National Accreditation Council to partner with CSAM/ANTAM to **adopt international testing codes and standards**
- Establish the first **Machinery Testing & Evaluation Center in Punjab** for agriculture machinery and implements



3. Diversify Uses of Crop Residues



Integrated Straw Management: *Developing value chains*

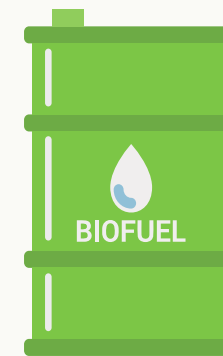
Straw used as Fertilizer



- Incorporate in soil as mulch using choppers, mulchers
- Sow new seed through low-tillage Happy/Super seeder
- Reduces fertilizer cost
- Improves soil health

Biofuel Production

- Generate **ethanol** from rice residues to increase utilization of straw and reduce dependency on fossils



- 20% of world's rice straw is used to produce 40 billion litres of ethanol
- **Pellet-making** for household & industry use
- Biogas **digester equipment**

Mushroom Cultivation

- Use of rice straw as base material to cultivate mushrooms under metal roofing sheds



- The substrate further used as a natural fertilizer for fruit trees and vegetables to reduce application of chemical fertilizers
- Successful in Vietnam & China

4. Policy and Advocacy



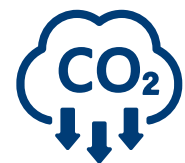
Monitoring and reporting of fire hotspots & air quality (satellite & ground-based remote sensing, air quality sensors)



Legislation and enforcement to prevent residue burning



Preparation of a crop residue management policy



Introduce carbon credit schemes



Awareness raising and capacity building of farmers



Regional cooperation for integrated approach (joint research, analysis, data-sharing)

Air pollution is cross-boundary in nature, collective efforts across the region are required

Let's make burning a burning issue!



Thank you

