Integrated Crop Residues Management in India

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Crop Residue Management in South Asia:

Advancing Subregional Cooperation for Sustainable, Climate-smart and Integrated Management of Crop Residues

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Crop Residue Burning in India

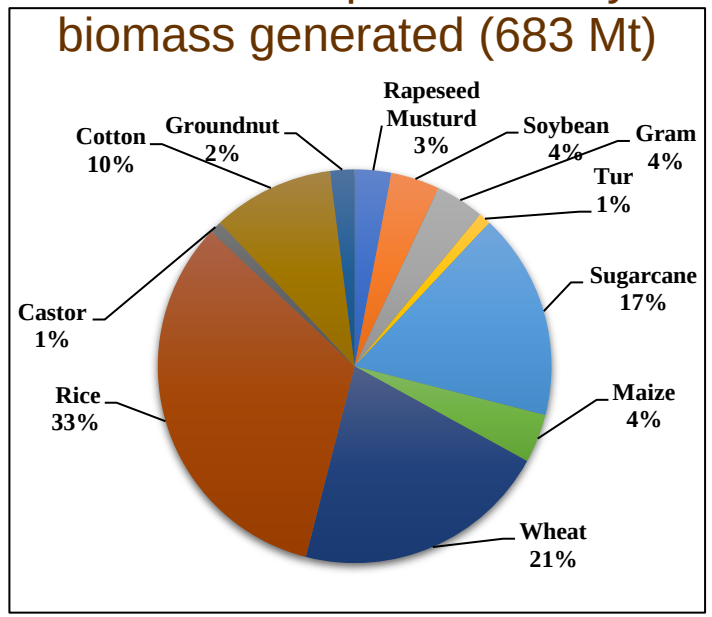
General Information

- **Total crop residue burnt** - 140 million tonne/year
- **Over half of burning is in 3 states** – Punjab, Haryana and Uttar Pradesh
- **40% of all crop residue burning is attributable to paddy straw**, 22% to wheat residue and 20% to sugarcane

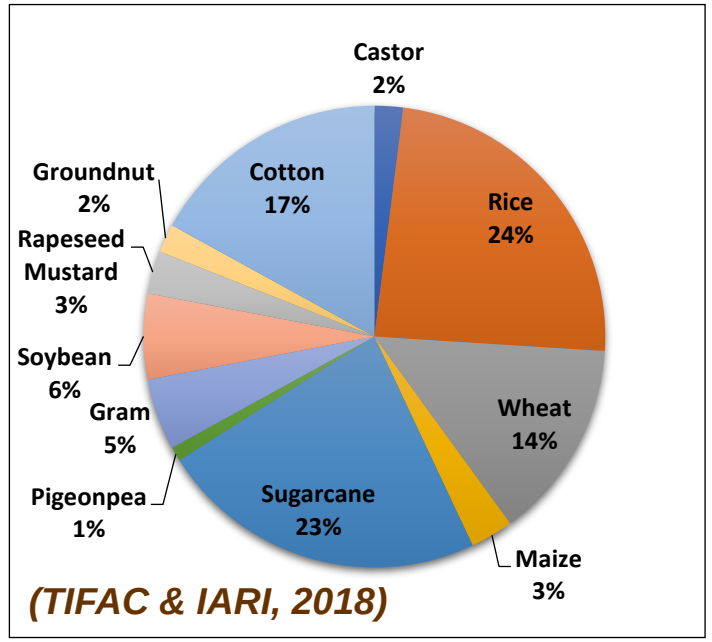
Reasons

- Very **short time interval** (10–20 days) for sowing of next crop (Rice-wheat cropping system)
- **Labour scarcity** and high cost of collection and storage
- **Lack of storage** facilities and **market opportunities**
- **Stalks interfere with sowing** of subsequent crop
- **High cost to plough back stubbles** mechanically
- **Paddy straw is less preferred** as ruminant feed

Share of crops in total dry biomass generated (683 Mt)



Surplus biomass -178 Mt **(26%)**



Best Practices of In-situ Crop Residue Management in India

Promotion of Agricultural Mechanization and Machinery for In-situ Management of Crop Residue - Punjab, Haryana, Uttar Pradesh and NCT of Delhi (2018-19 to 2021-22) (INR 24.52 billion)

- Establish **Farm Machinery Banks or Custom Hiring Centres** of in-situ crop residue management machinery (80% subsidy)
- **Procure agriculture machinery and equipment** for in-situ crop residue management (50% subsidy)
- Execute **Information, Education and Communication strategies** to create awareness on in-situ crop residue management among farmers, users and stakeholders.

Paddy straw chopper cum spreader

Super SMS

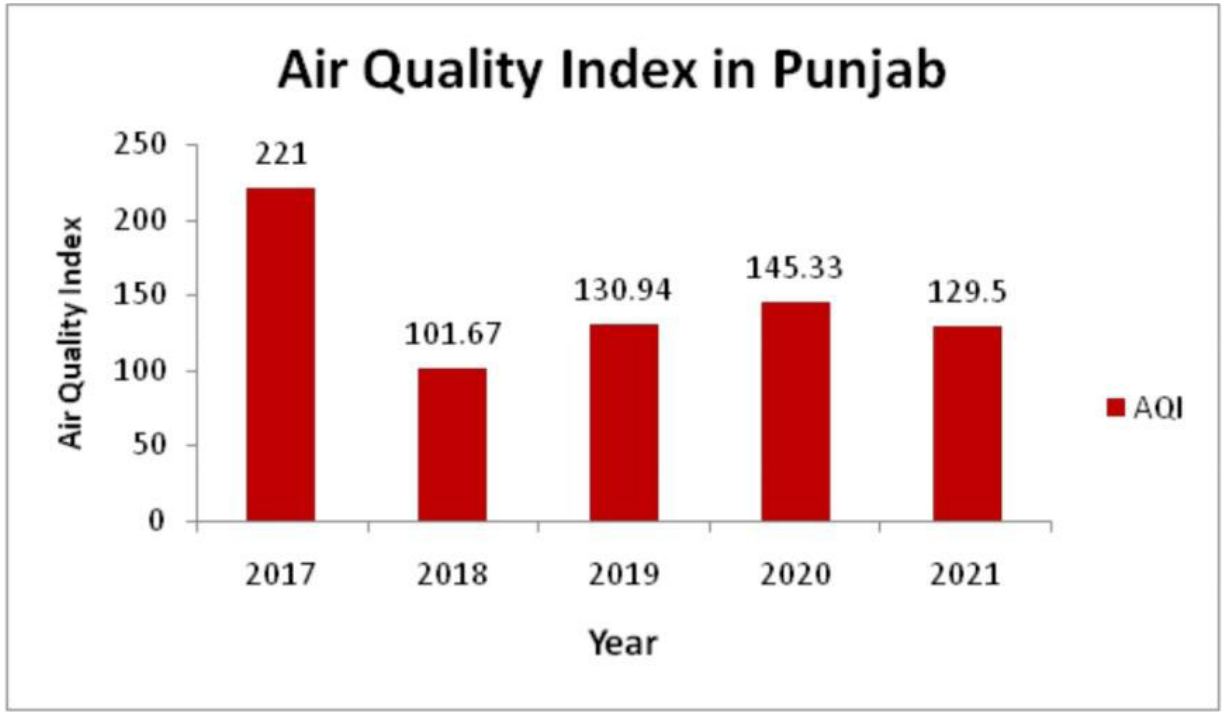
Happy Seeder

Super Seeder

0.213 million equipment/machines and 39391 custom hiring centres

Impacts/Benefits of In-situ Management of Paddy Straw in Punjab state

- Paddy straw burnt on 83.97% of paddy area in 2017 declined to 37.42% in 2019.
- Fire events decreased from 102,379 in 2016 to 50,738 (2019).
- Average air quality improved from “Poor” in 2017 to “Moderate” during 2018-2021 (Source: ppcb.gov.in)
- Soil organic carbon increased from 0.42% under conventional tillage to 0.65% in case of surface retention of paddy straw with Happy Seeder (10 years study).



Best Practices of Ex-situ Crop Residue Management in India

- **Biomass pellets** from crop residues for use as fuel in power plants
  - 5-10% blending with coal
- **Power generation** from biomass
  - Over 5,940 MW biomass-based power plants
- **Ethanol production** from crop residues (lignocellulosic biomass)
  - Increase blending of ethanol in gasoline from 10 to 20% by 2025
  - 2G ethanol plant by IOC - INR 9 bn ($113.4m), 30 M-litres of ethanol using 200,000 t/year of paddy straw.
  - Plans to invest INR 100 bn for 12 2G-ethanol plants
- **Biogas/Bio-CNG production** from paddy straw at community level
- **Briquetting** of crop residues as an industrial fuel supplement
- **Composting** of paddy straw




Recommendations to Address Crop Residue Burning in India

CRM Mechanization	• **Improve existing CRM machinery** to reduce power requirements and to work in moist straw and other adverse conditions • **Improve access to CA machinery** through financial incentives, CH schemes
Laws and legislation	• Develop **crop residues management policy** for each state defining various competing uses • In-situ management of crop-residues to be supplemented with ex-situ management
Other interventions	• **Implement scheme of In-situ Management of Crop Residue in other states** based on availability of surplus crop residues. • Promote utilization of crop residues through community mobilization as **animal bedding, fodder, composting and mushroom cultivation** • **Biogas production** from crop residues at community level • **Biomass pellets** from crop residues as a fuel substitution in thermal power plants • Industrial level production of **Bio-CNG/Compressed Bio-gas (CBG) from paddy straw** • Incentivise power generation from bio-mass • **Promote 2G biomass based ethanol plants** in PPP mode.

Recommendations Relevant for Other Countries or at Sub-regional Level

- **Most relevant and sustainable technique recommended for the sub-region is in-situ management of crop residues.**
  - **Environmentally sustainable**
  - **Financially sustainable**
  - **Soil health improvement**
  - **Sustainable production and productivity in long run.**

Combine harvester with Super SMS and Happy Seeder

- **Ex-situ management techniques** recommended for the sub-region:
  - **Biogas production from paddy straw** at domestic/community level
  - **Biomass pellets** from crop residues as a fuel substitution in thermal power plants
  - **Power generation** from crop residues

Thank you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