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%)

(TIFAC & IARI, 2018)
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.

Super SMS
Happy Seeder
Super Seeder

Paddy straw chopper cum spreader

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.

• 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

Combine harvester with Super SMS and Happy Seeder
Thank you