Mechanization-based solutions for crop residue burning

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Straw burning problem

• Nearly 30 million tonne of paddy straw are generated in Punjab and Haryana (More than 700 MT in India).
  – about 7 million tonne (from 0.8 million ha) is removed from the field for alternate uses like power generation, biofuel, feeding animals and for heat generation etc.
  – about 23 million tonnes of paddy straw (from 2.8 million ha) is burnt in the field as an easy and quick method of disposal.
Straw burning contd...

- Burning of 23 million tonnes of rice residues in NW India leads to a loss of about 9.2 million ton of C equivalent (CO₂-equivalent of about 34 million ton) per year and a loss of about 0.14 million ton of N (equivalent to US $ 27 million) annually.

- It is estimated that one ton rice residue on burning releases 13 kg particulate matter, 60 kg CO, 1460 kg CO₂, 3.5 kg NOx, 0.2 kg SO₂.

- Thus, burning of straw causes phenomenal pollution problems in the atmosphere and huge nutritional loss and physical health deterioration to the soil.
Present Practices

• Time available between the rice harvesting and (i) wheat sowing is 20-30 days, and (ii) vegetable sowing almost NIL.

• At present, after harvesting rice by combine, the farmers sun-dry the straw for a few days (4-5 days) and then burn them in the field before preparing the field for sowing next crop
  – by using disc harrow, rotavator, cultivator and planker and sow the wheat/potato by seed drill/planter.

• The mental set up- if field is not cleared, we are going to loose next crop or we get low production of wheat.
Management of paddy stubble/straw

- Two alternate and safe methods for straw management.
  - In-situ
  - Ex-situ

- Baling and transporting straw from field, though appear to be an option for safe disposal, it may not be feasible currently and till alternate usage facilities are created for effectively using the baled straw.

- The ex-situ straw management options are more capital intensive and would require significant subsidy amounts for farmers and user industry to be sustainable.
In-situ straw management

• Financially most **viable** and **workable** option in the immediate short run.

• **Mulching** and **incorporation** are the two suggested methods of in-situ straw management.

• **Mulching** can be practiced where rice is followed by wheat and **incorporation** can be adopted when rice is followed by vegetables or other crops.
In-situ straw management contd..

• From residue incorporation, farmers’ may save about 1600 kg C, 20-30 kg N, 4-7 kg P, 60-100 kg K, 4-6 kg S in addition to micronutrients, which is equivalent to US$ 20 - 30 per ha for plant nutrients (after 3-4 years).

• Saving of one irrigation (Electricity: US $ 10/ha, labour: US $ 10/ha) in wheat crop by in in-situ straw mulching (by Happy seeder)
Viable and scalable solution for Rice-Wheat cropping- *Straw* mulching and Sowing

- Attachment of *super Straw Management System* in Existing Combines
- Direct wheat sowing with Happy Seeder/ Super seeder
For Rice-Potato/vegetable cropping system- **Straw incorporation**

- Paddy straw Chopper-cum-spread / Mulcher + Reversible Mould Board Plough or / and Rotavator + Sowing of potato / vegetable / other crops with *seed drill/planter*
Govt. Scheme

“Promotion of Mechanization for In-Situ Management of Crop Residue in the states of Punjab, Haryana, UP and Delhi”

- Funds released in 2021-22: US $ 93 million
Central sector scheme on In-situ mechanization contd.....

• During past three years, **158,000 equipment / machines** were supplied in these states (Punjab-68762, Haryana-50934, and UP-32829)

• **30,960 Custom hiring centres** were established (Punjab- 21126, Haryana- 4224 and Uttar Pradesh- 5611) for making easy availability of equipment / machines to small and marginal farmers on hire basis.

• **Mobile app-based aggregator** platform to facilitate hiring of machines from Custom Hiring Centres was developed and established.
## IEC Activities

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<th>S. N.</th>
<th>Particulars</th>
<th>Activities</th>
<th>No. of Participants</th>
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<td>1</td>
<td>Awareness programmes</td>
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<td>2</td>
<td>Training Programmes</td>
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<td>3</td>
<td>Farmers fairs</td>
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<td>4</td>
<td>Mobilization of schools (through essay completion, painting, debate )</td>
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<td>5</td>
<td>Demonstrations (ha)</td>
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## IEC Activities contd......

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<td>Advertisement in Print media</td>
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<td>Column / Articles in newspaper, magazines etc.</td>
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<td>Hoarding fixed (at Mandi/ Road side/ Market etc.)</td>
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Benefits of residue incorporation

Survey conducted by the ICAR-KVKs in Punjab and Haryana revealed that the Happy seeder/super seeder sown (in-situ crop residue managed) wheat farmers got the following advantages as compared to the conventional system:

• 2.7% higher wheat yield
• 25% less water (1 irrigation)
• 20 kg urea saving per ha.
Burning Events

• Burning events were monitored by multiple satellites with thermal sensors during the harvest period from 15-Sep. to 30-Nov. in the states of Punjab, Haryana and UP.

• The burning events during 2019 in 3 states (Punjab, Haryana and UP) were:
  - 19% less than 2018
  - 31% less than 2017
  - 52% less than 2016.
Thank You All