

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 (CO_2 -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 CO_2 , 3.5 kg NO_x , 0.2 kg SO_2 .**
- 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 plunker 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-situ straw mulching (by Happy seeder)

Viabile 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**



Govt. Scheme

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

- Funds released (2018-19, 2019-20 & 2020-21): US \$ 230 million
- 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

S. N.	Particulars	Activities	No. of Participants
1	Awareness programmes	1817	145655
2	Training Programmes	696	20885
3	Farmers fairs	130	604831
4	Mobilization of schools (through essay completion, painting, debate)	810	88086
5	Demonstrations (ha)	28247	44582
6	Exposure visits	408	10055
7	Field days	340	12792
8	Harvest days	83	1759

IEC Activities contd.....

S.N.	Particulars	Activities
9	Advertisement in Print media	987
10	Column / Articles in newspaper, magazines etc.	1064
11	Hoarding fixed (at Mandi/ Road side/ Market etc.)	2829
12	Poster/Banner placed	35083
13	Publicity material - leaflets/ pamphlets etc.	1063289
14	TV programmes/ panel discussions	262
15	Wall writings	8251

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