

Integrated Straw Management and Potentiality in Bangladesh

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Brief outline of the Presentation

- Agriculture in Bangladesh
- Status of Crop Straw Resources
- Status of Straw Burning
- Challenges and Constraints in Addressing Straw Burning
- Good Practice in Addressing Straw Burning Through mechanization Solution
- Recommendations
- Suggestions for National and Regional Level

Agriculture in Bangladesh

- Bangladesh's main objective is achieving food and nutrition security
- Nearly 11.38 percent of Bangladesh's GDP comes from agriculture, which also employs 45.33% of the labor force (BBS, 2022).
- The net cultivated area of Bangladesh is 8.8 million ha, and the current cropping intensity is 198% (BBS, 2022).
- Rice, wheat, and maize are the major food grains in Bangladesh, and the volume of production is increasing to meet the demand of an increasing population.
- Rice, wheat, and maize production in 2022-23 are 39.05, 1.17, and 6.42 million tonnes, respectively (DAE, 2023).



Figure. Map of Bangladesh Major Crop Growing Area



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Status of crop straw

Types of crop straw resources

- Crop straw in Bangladesh is mainly produced from **grain crops** (rice, wheat, maize), **oil-seed crops** (mustard, sesame, sunflower), **fibre crops** (jute, cotton, kenaf), and **other crops** (sugarcane, tobacco).
- Rice, wheat, and maize are **main straw sources** in Bangladesh.

Harvesting of rice, wheat, maize, and straw production

- Most of rice and wheat are traditionally harvested by manual cutting using the sickle. For monsoon rice, cut crops are laid down in the field for two to three days for initial drying
- Wheat is transported immediately after harvest for threshing. Produced straw is kept in heaps near the threshing yard, and at a suitable time straw management work takes place.
- After harvesting maize cobs, standing maize stalks (maize straw) are manually cut, which is a tedious and costly operation



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Rice Straw

Rice straw production increase from 59.908 MMT to 63.996 MMT during this period from 2019-20 to 2022-2023.

Maize Straw

Maize straw production was 4.015 MMT in 2019-20 which increased by 6.422 in 2022-23.

Wheat Straw

Wheat straw production increase from 1.481 MMT to 1.684 MMT during this period from 2019-20 to 2022-2023.

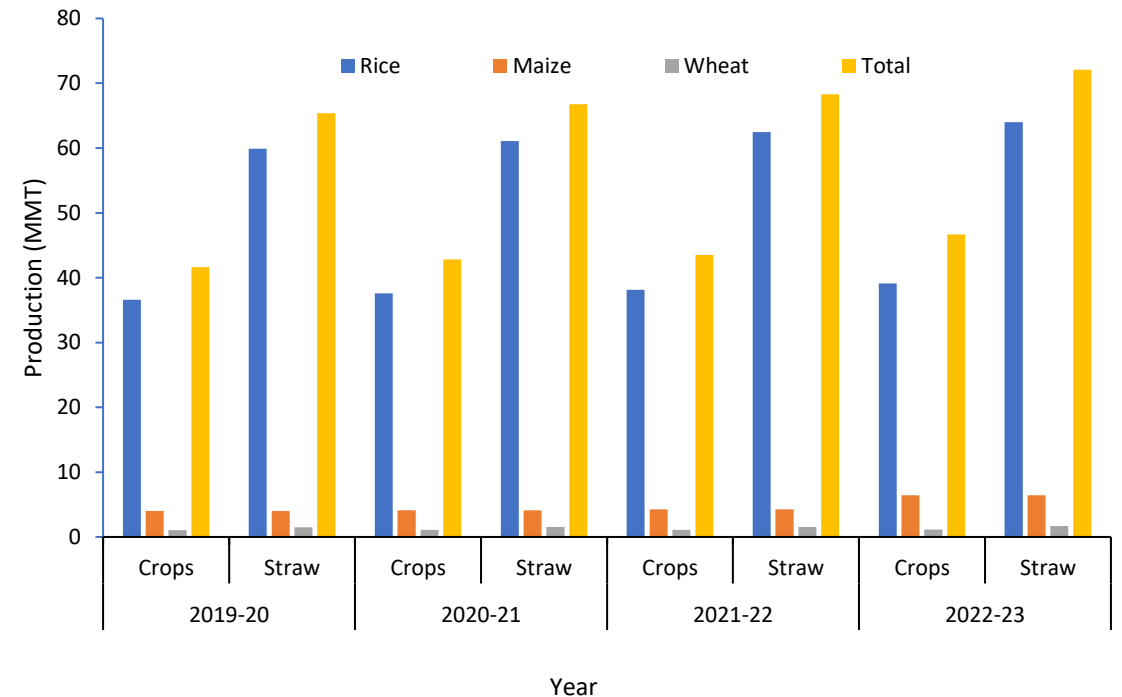


Fig. Rice wheat and maize production and estimation over the year



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Status of straw burning in Bangladesh

- The burning of rice stubbles or straw was a normal practice when deep-water rice (DWR) was cultivated throughout the country. Now the coverage of DWR rice has reduced to some small pocket areas of the country and the practice of straw-burning is not much noteworthy.
- Open field burning of rice straw is not common due to sickle harvesting and the manageable amount left behind, which can be handled through ploughing with a Power tiller, Tractor, etc.
- However, recently the use of combine harvesters is leading some farmers to consider burning straw.
- Farmers typically burn long types of straw like creeper vegetables, local rice, wheat straw, and dry maize residue, as these are not suitable for cattle feed or cooking fuel. Incorporating this excess straw into the soil is challenging and costly to collect.
- In the 2022-23 period, it is estimated that **72.10 million tonnes** of crop residue were produced, with **0.22 million tonnes** being burned (DAE, 2021)



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- There are 14 agricultural regions in Bangladesh. Table showed the percent of burned residue in the agricultural region which is very little amount (less than 1% of total residue).
- In low-lying areas, Aman rice residue burning is more dominant.
- In the hilly areas for zoom cultivation farmers burnt the straw residue.
- In Bogura, Rangpur and some areas of Rajshahi region burnt wheat and maize residue for quick land preparation for the next season.

Table. Region-wise crop burned residue percentage at 2020-21

Region	% of burned residue	Remarks
Dhaka	0.155	Residue in low lying area, after Aman rice harvest
Mymensingh	0.093	
Cumilla	0.153	
Sylhet	0.084	
Chattogram	0.059	Jhum cultivation
Rangamati	0.192	
Rajshahi	0.688	Residue in low lying area, after Aman rice harvest and wheat residue in Barind dry area, Chalan Beal area
Bogura	0.519	Residue in low lying area, after Aman rice harvest
Rangpur	0.138	Wheat and maize residue burning for quick land preparation
Dinajpur	1.183	Wheat and maize residue for next crop planting
Jashore	0.143	
Khulna	0.125	
Barisal	0	No burning found
Faridpur	0.570	Residue in low lying area, after Aman rice harvest



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Challenges and constraints in addressing straw burning

Economic Dependency on Agriculture

Due to resource constraints and the urgent need for land preparation, many farmers select for straw burning as a quick and **cost-effective** method

Lack of Awareness and Education

There's a notable lack of awareness among farmers regarding the detrimental effects of straw burning on soil health, air quality, and public health. A surveyed data showed that some farmers believe that using stable burning ash has positive impact on the fertility of their land.

Destroy pests and pathogens

In some emergency cases burning is prescribed by the Department of Agricultural Extension (DAE) to get rid of the pests and pathogens like Brown Plant Hopper for rice, Blast for wheat etc.



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Limited Access to Technology and Resources

Smallholder farmers in Bangladesh often face challenges in accessing appropriate technologies and resources for managing agricultural waste efficiently. Now there are no government restriction in place regarding straw burning.

Policy Implementation and Enforcement

As of now there are no government restriction in place regarding straw burning.

Seasonal Constraints and Time Sensitivity

Bangladesh experiences distinct wet and dry seasons, with farmers under pressure to prepare fields swiftly during the dry season for rice cultivation. This time sensitivity, coupled with seasonal constraints, complicates the adoption of alternative methods to straw burning



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Straw Management System



Threshing and produced straw



Collection of straw



Straw Drying



Haystack



Transportation



Cattle Farm



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- In Bangladesh, both head feed and whole feed types combine harvester contributing to the harvesting of approximately 17% of the total cultivated land.
- Combine harvesters facilitate the harvesting, threshing, grain collection in tanks, and the spreading of straw in the field.
- As a result of the introduction of mechanization, the farming and crop management systems are changing along with straw management from traditional practices to mechanical harvesting and threshing practices.
- Under mechanized harvesting, most of the crop straw remains in the field and needs to be collected with extra labour and cost.
- **Straw Baler/combine baler** would be the appropriate machine for management of straw.



Whole feed Combine



Head feed Combine



Baler for collecting straw



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Good Practice in addressing straw burning, through mechanization solutions



Cattle feed

Rice straw is preferable feed for cows and buffaloes but wheat straw is not fed to **cows and buffaloes** in Bangladesh. Chopped green corn stalk is also a good feed for animals.

Chopping rice straw, soaking and mixing with **liquid molasses** is a quality feed for animals. **Maize silage** is a good option for animal feed.



Chopper



Straw incorporation

Remaining straw after harvesting is directly incorporated into the soil by ploughing.

Conservation agriculture machinery allows for planting through crop residues. The straw decomposes slowly and adds organic matter into the soil.



Planter



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Cooking

Small holder farmers and low-income families use straws for cooking. Rice straws for is used as domestic fuel in rural areas.



Chopped straws with additives are compressed for making densified fuel such as briquette pellets.



Briquette machine



Mushroom cultivation

Rice and wheat straws are used for mushroom cultivation (yearly mushrooms production about 40000 MT).



Chopped straws with additives are compressed for mushroom cultivation



Chopped straw



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Fertilizer incorporate with soil

Unused straw from cowshed is dumped in a place and used as fertilizer.



Rice and wheat straw mixed with cattle manure is kept in dug soil protected above by a shed for composting for about 3 months and applied in the field for crop cultivation.



Composting



Cow dung & straw mixer

Cow dung with wet rice straw is used in bio gas plant. Cow dung with wet rice straw is used in biogas plant



Chemically pre-treated straw mixed with cattle or poultry manure make straw more biodegradable and produce more biogas for domestic cooking and lighting in rural areas.



Biogas plant



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Rice straw, either chaffed or unstuffed, is used as packing material to transport mangoes, tomatoes, ceramic or glassware to avoid breakage/spoilage.



Rice and wheat straw may be used for straw rope or manufacturing composite paper and particle board.



Straw rope maker



Straw particle board



Biochar production



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Recommendations

On-farm activities

- Introducing of conservation agriculture technologies and machinery for resource management through appropriate straw management.
- Straw incorporating with soil rotavator
- Bio-char production

Off-farm activities

- Increase the use of crop straw for [composting](#).
- Enhancing the use of rice and wheat straw in the appropriate ratio for [mushroom cultivation](#).
- Energy use: Solid fuel (pellet, briquette), biogas, biofuel Use of rice straw briquettes for densified source of fuel in rural areas.



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Suggestions for National Level

- Policy development to band open burning
- Encourage government and non-government organizations to research stubble burning for find out the better alternatives and drawbacks
- Alternative and value-added use (paper making, bioenergy, etc) of straw
- Awareness build up to create awareness about the impact of straw burning.
- Encourage the farmers to the alternative use of straw.
- Government subsidy required for developing workshop/entrepreneur to support farmer for hiring or purchasing agriculture-based machinery, straw combines, balers, etc.



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Suggestions for Regional Level

- Bangladesh does not have any regulatory policy on crop burning, at the regional level, ESCAP and CSAM can bring various policy makers to share their experiences and assist Bangladesh in formulating such policies.
- ESCAP and CSAM may help Bangladesh by setting [pilot program](#) in different region of the country regarding integrated straw management and training of officials on benefits of straw management would be important.
- Support the Bangladesh Specially, BRRI and DAE to organize a national workshop on "[Crop straw management](#)" at local level involving all stakeholders and broadcast the message among the agricultural community using print and electronic media.



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