

Paddy Straw Burning Needs to be Stopped: Why

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Introduction: It's almost end of year, 2024 November month. Winter is on the way. Still feeling hot? Amazing! We are facing the side effects of green revolution. With each passing year we are facing devastations in one or the other form. With tremendous growth in human and livestock population, we are producing abundance of food grain in order to meet out hunger of all. We shifted from multicropping to monocropping with use of improved plant varieties, seed and chemical fertilizers and subsidies for electricity and fertilizer. In this process we have being killing our friendly pest, deteriorating soil and disbalancing our biological cycle. In the urge to produce more, we have been neglecting warnings of nature. Although green revolution has made us self sufficient in food production but at the same time we have failed in handling the secondary output of our food, the straw which is considered product of mechanized agriculture. The length of straw and stubble remaining on using combined harvester and thresher for paddy in field act as hindrance for machines used for wheat sowing. Insufficient storage space, high cost involved in its compaction and conversion to other utilizable produce, mechanized harvesting and to gain more profit in limited time with human labour shortage and other inputs have forced farmers to burn the remains after grain harvest in field itself. Notable one is Stubble burning which creates a menace over whole of north India in form of smog leading to devastating situation soon after Diwali.

Stubble / parali burning is an act performed by farmers to clear the fields of rice straw/residues after harvesting grains by combine in order to go for wheat sowing which starts from September to Mid of December. This act results in severe air pollution over Northern Indian States mainly Haryana, Punjab, Delhi, Uttar Pradesh and Rajasthan. Fireworks add fuel to this pollution. When it combines with vehicular emissions, air quality index (AQI) may reach dangerous level (>400) affecting health of all living species whether plant, animal or human being. Although on 10th December, 2015 National Green Tribunal (NGT) had imposed ban on burning of crop residues in these States but National Policy for Management of Crop Residues has not been implemented strictly. This burning of crop residue is a criminal offence under Section 188 of IPC and Air and Pollution Control Act, 1981 which is mostly overlooked. Time to time fines were also imposed on farmers but failed to prevent this burning. In 2016, penalty amounting to Rs 73.2 Lakh was charged by Punjab Government from farmers. It has become common practice to burn wheat, rice and sugarcane leaves residues. About 500 million tonnes of crop residual matter is produced in India and 70% arises from cereals like wheat, millet, maize and rice. Among these 34% is from rice and 22% from wheat crop. Every year, in Punjab itself 20 million rice stubbles are produced out of which 80% are burnt which in another way could have been used for feeding dairy livestock, mushroom cultivation, fuel, packaging material, biomass energy, as shelter for roofing, composted as manure or for bio-ethanol and for

industrial production. Rice stubble burning is highest in Punjab, followed by Haryana while wheat stubble is highly noted in Uttar Pradesh. With Centre and State government working hand in hand on this issue, new machines and technologies have been promoted but farmers seem reluctant to use them. Farmers consider stubble burning as cheapest and quickest method to clear their fields, just requiring a matchstick. Innovative solutions need to be searched for sustainable and pollution free farming system, thereby promoting health of all.

As now smoke clouds have become perennial issue, people can be seen grasping for breath with air purifiers and fresh air in Delhi and nearby areas. Government is forced to take measures like closing educational institutions, offices in online operation, restricting entry of diesel vehicles, applying odd-even traffic rules and temporarily putting stop on construction activities. Even face masks seem futile. As inversion occurs, pollutants are unable to escape in atmosphere. The only hope lies in strong wind and rainfall. In 2022, New Delhi was ranked second (AQI-219) in world's polluted cities after Kashgar (China) with AQI-222. But this time AQI has been reported more than 500 which indicates a severe plus category and is highly serious. It is 20 times more than World Health Organization permissible limit.

Impact on human/animal Health and behavior:

Cases of respiratory problem have increased in human patients mainly suffering from ailments like asthma, bronchitis and cardiovascular problems, sometimes requiring hospitalization. Due to decreased Oxygen saturation rate, breathing issues are prevalent. Pollutants in air are also affecting water quality, soil micro biota, and environmental temperature. Other health issues include skin irritation, cancer, neurobehavioral disorders, premature deaths, shorter lifespan, reduced energy levels, dizziness, headache, irritation in nose, eyes, throat and mouth, reduced lung functioning, disruption of reproductive (reduced sperm quality, decreased fertility), endocrine and immune system. Newborn are underweighted with growth retardation in intrauterine or born prematurely. Mostly at this time, due to pollution, more morbidity and mortality with clinical symptoms are been noted. Due to pollution of drinking water kept in open premises, waterborne diseases like typhoid,

liver and kidney damage are common. In domestic animal, fluorosis, mercury poisoning, plumbism and pesticide toxicity have begun which needs intervention. In response to internal and external stimuli, like human, animal responses also change. Negative stimuli and stressors are produced due to environmental pollutants. The animal organs and structures get changed due to behavioral changes which is best and earliest indicator that animal is under stress (physical/mental) resulting in decreased production and growth. Coughing, diarrhea, lameness, eye discharge has been reported in animals. Study conducted in Punjab revealed that about 84.5% people had health issues due to smog incidence. About 76.8% have reported irritation in eyes, 44.8% in nose and 45.5% in throat, cough in 41.6% cases and wheezing in 18%. People had been spending every year major part of their income on treatment for ailments due to stubble burning. Life expectancy has decreased by 6.4 years due to high pollution levels.

Impact on Air Quality: On an average, one ton paddy straw contains 5.5 Kg of nitrogen, 2.3Kg of phosphorus, 25Kg of Potassium, 1.2Kg of sulphur, 400Kg of carbon and 50-70% of micronutrients absorbed by rice during growth period, but on burning this paddy straw 3Kg particulate matter, 1460Kg carbon dioxide, 60Kg carbon monoxide, 199Kg of ash and about 2Kg of sulphur dioxide are released polluting the air which could have been utilized for other useful purpose like feeding. Toxic pollutants emitted in atmosphere due to stubble burning mainly include harmful gases like methane, carbon monoxide, carbon dioxide, volatile organic compounds and carcinogenic polycyclic hydrocarbon which are aromatic in nature. These mostly get dispersed in surrounding area, affecting quality of air and health of living beings by forming smog thick blanket.

Impact on Soil Health: It has been noticed that soil composition/fertility is affected mainly the humus and micro biota on upper layer of soil. Husk burning leads to nutrient loss mainly moisture, useful microbes and soil erosion as heat generated when penetrates one centimeter of soil, it elevates temperature to 33.8-42.2 degree Celsius resulting in killing of the fungal and bacterial population which are critical to improve soil health. Carbon and nitrogen in soil are reduced which is must for root

development. Stubble burning has been discouraged /prohibited in UK, Australia and China also.

Can Stubble burning be avoided? Different attempts have been made now and then by our Government and Scientists to get rid of these problems which are as follows

(1) Use of bio-enzyme-PUSA developed by IARI:

This enzyme decomposes stubbles on which it is sprayed in 20-25 days, forming manure which can be used to improve soil. Organic carbon content of soil increases which is required for next crop. This enzyme makes straw soft, ploughable, breaking down molecular components and makes release of nutrients when applied in field. It helps in reducing fertilizer use and costs only Rs 1000 per acre.

(2). Crop residue management: It can help in keeping soil fertile and in saving Rs 2000 per hectare if this straw is used for composting to be used as manure.

(3). Use of Innovative and advanced agricultural machinery

- a) Happy Seeder: This is a tractor mounted machine which cuts, lifts the straw/stubble for sowing wheat in bare soil and then straw gets deposited as mulch over it. About 10-acre area can be covered in a day by this machine. Farmer requires spending Rs1000 for rent in addition to diesel cost amounting to Rs 2000. But availability along with suitability is still an issue.
- b) Rotavator: It is mainly used for preparing land and incorporating standing stubble in the soil.
- c) ©Zero till seed drill: It helps in sowing seed directly in crop stubble of previous crop.
- d) Baler: This machine takes about an hour per acre and produces bales, 12-15 quintals of paddy stubble after collection. These bales can be sold to biomass factories.
- e) Paddy Straw Chopper: This machine helps in chopping straw and spreading into field thereby making wheat sowing easy.
- f) Reaper Binder: It is used for paddy stubble harvesting and formation of bundles.

As the cost of above machines is high, State government should provide subsidy, so that farmers can be encouraged to opt for it. Reports indicate that government do provide subsidy of 50-80% for machines used in crop residue management and provision of Rs 1,151.8 crore is there for National Capital, Uttar Pradesh, Punjab and Haryana under this scheme.

(4) Pelletisation/Biomass briquettes formation:

Pellets or compressed blocks can be formed using coal of paddy straw after drying them which in later stage may be used in industries and thermal power plants as fuel. This product helps in saving coal and reducing carbon emissions. Stubble can be converted into biochar to be used as fertilizer after burning in kiln which is about 10feet wide, 14 feet high and accommodate about 12quintal rice straw. About 6.5 quintal biochar can be produced in just 10-12 hours.

(5) Gauthans development: This has been promoted by Chhattisgarh Govt. in villages to generate employment. Usually, gauthans are plots about 5 acres in area where village residents collect unused stubble/parali which in later stage turns into organic fertilizer on mixing cow dung along with natural enzymes.

(6) Other Uses: Stubbles can be used for feeding livestock after treatment or as such, packaging material, poultry litter, animal bedding, compost for mushroom production, paper preparation, mats, agri-fibre boards, bioethanol preparation etc.

(7) Stubble management revitalization: Check is needed by schemes like MNREGA that stubbles after being post-harvested are properly managed. Incentives need to be given to farmers who recycle and reuse their stubble to encourage others to do so.

(8). New varieties: Use improved new varieties of wheat and rice like PR-126 and Pusa Basmati-1509 which are of short duration, mature quickly and also improve soil quality. Usually, basmati straw is not burned as it is often used for feeding animal. Feed and fodder market need to be developed for using this stubble for feeding in deficit areas in Rajasthan, Maharashtra and Gujarat.

(9) Create awareness: Farmers needs to be made aware of consequences of stubble burning, nutrient

losses and promote them to use technologies which are eco-friendly. If stubble is retained, it helps in minimizing risk of erosion, promote nutrient recycling, and microbial biomass in soil, water use efficiency and soil health is improved, retaining soil moisture, reducing evaporation and help in rainfall taking place in autumn season. Farmer needs to adopt diversified cropping and sustainable farming system.

Conclusion: Proper management of crop residue can only help us to get rid from the air pollution which is hampering our health.