Technical Bulletin – 6

Organic Farming

STUBBLE (PARALI) BURNING

DAY – National Rural Livelihood Mission

STUBBLE (Parali) BURNING

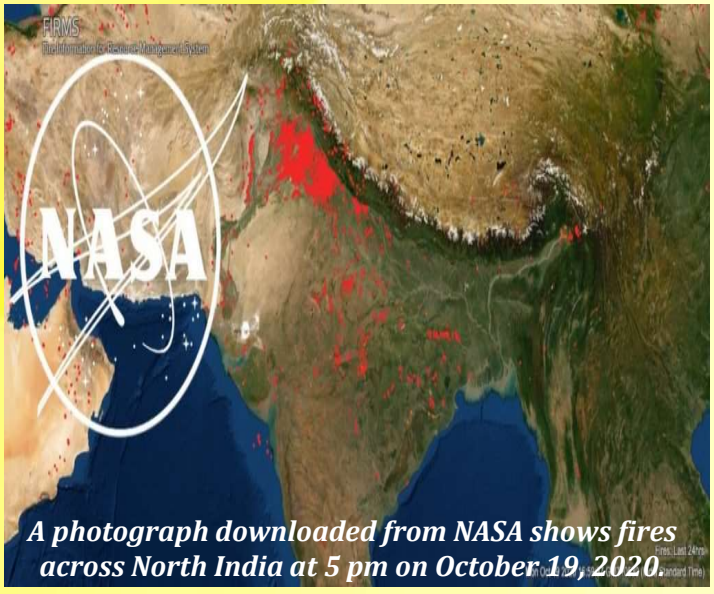
Parali or Stubble?

After ripening of the grains, such as paddy, corn, etc., the upper portion of the plant is harvested and the lower portion is left behind. The lower portion remains on the field with roots underneath. With mechanized tools for harvesting, the crop is cut from even a higher part which leaves stubble with slightly increased length. This leftover part of the crop has no commercial value for the farmers.

Illustration of stubble burning

Stubble Burning?

Stubble burning is a method of removing crop residues (leftover)from the field to sow crop for the next season. Stubble burning is a process of setting on fire the straw stubble, left after the harvesting of grains. The process of burning crop residue is one of the major causes of air pollution in parts of north India, deteriorating the air quality as thick, dark plumes of smoke and soot start to risen into the air over the Indo-Gangetic plains every year.



A photograph downloaded from NASA shows fires across North India at 5 pm on October 19, 2020.

It is usually a practice in the areas that use combined harvesting method, which leaves crop residue behind. As a result of the lack of infrastructure for waste management, farmers set almost 15.4 million metric tons (out of the 19.7 MMT) on fire in open fields (Punjab government 2017).

Open-field biomass burning is a longstanding method for land clearing and improvements in land use to dispose of living and dead vegetation. It has been estimated that humans account for nearly 90% of biomass combustion, although only a small portion of natural fires are responsible for the overall amount of vegetation burnt.

Stubble burning is practiced majorly in the Indo-Gangetic plains of Punjab, Haryana, and western Uttar Pradesh and in north India and is a major cause of air pollution in National Capital Region.

Ill effects of burning stubble

Loss of nutrients:

It is estimated that burning of one tonne of straw accounts for loss of 5.5 kg Nitrogen, 2.3 kg phosphorus, 25 kg potassium and 1.2 kg sulphur besides, organic carbon.

Generally, crop residues of different crops contain 80% of Nitrogen (N), 25% of Phosphorus (P), 50% of Sulphur (S) and 20% of Potassium(K). If the crop residue is incorporated or retained in the soil itself, it gets enriched, particularly with organic C and N.

A flow chart showing negative effect on stubble burning on environment

Detrimental to the Soil Health:

Heat from burning residues elevates soil temperature increase **up to 33.8°C-42.2°C** causing death of beneficial soil organisms. Frequent residue burning leads to complete loss of microbial population and reduces level of N and C in the top 0-15 cm soil profile, which is important for crop root development.

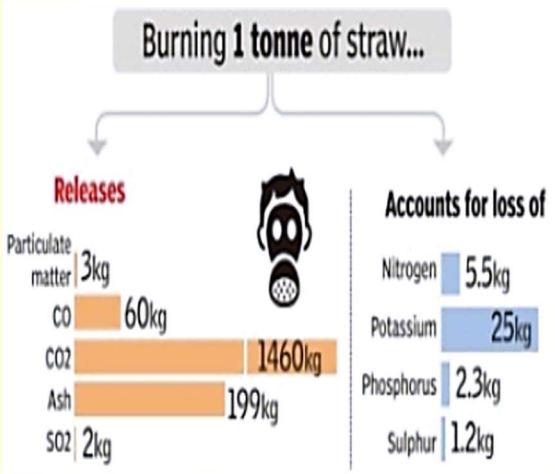
It hampers agriculture productivity because pollutants in the atmosphere lead to acid rain and prolonged exposure to particulate pollution favors growths of pests or diseases.

Emission of greenhouse and other gases:

Crop residues burning is a potential source of Green House Gases (GHGs) such as CH4, CO, N2O, NOX and other hydrocarbons. It is estimated that upon burning, Carbon (C) present in straw is emitted as CO2 (70% of Carbon present), CO (7%) and CH4(0.66%) while 2.09% of Nitrogen (N) in straw is emitted as N2O.

Effects on Human Health as well as on environment:

Gases like Carbon Monoxide and Carbon Dioxide released from burning of stubble results in severe air pollution. This creates a lot of health problems like skin and eye irritation, severe neurological cardiovascular and respiratory diseases, asthma, chronic obstructive pulmonary disease (COPD), bronchitis, lung capacity loss, emphysema, cancer, etc.



Alternatives

- In 2014, the Union government released the **National Policy for Management of Crop Residue.**

Farmers can also manage crop residues effectively by employing agricultural machines like:

- **Happy Seeder** (used for sowing of crop in standing stubble)
- **Rotavator** (used for land preparation and incorporation of crop stubble in the soil)
- **Zero till seed drill** (used for land preparations directly sowing of seeds in the previous crop stubble)
- **Baler** (used for collection of straw and making bales of the paddy stubble)
- **Paddy Straw Chopper** (cutting of paddy stubble for easily mixing with the soil)
- **Reaper Binder** (used for harvesting paddy stubble and making into bundles)
- **<u>Waste Decomposer:</u>**

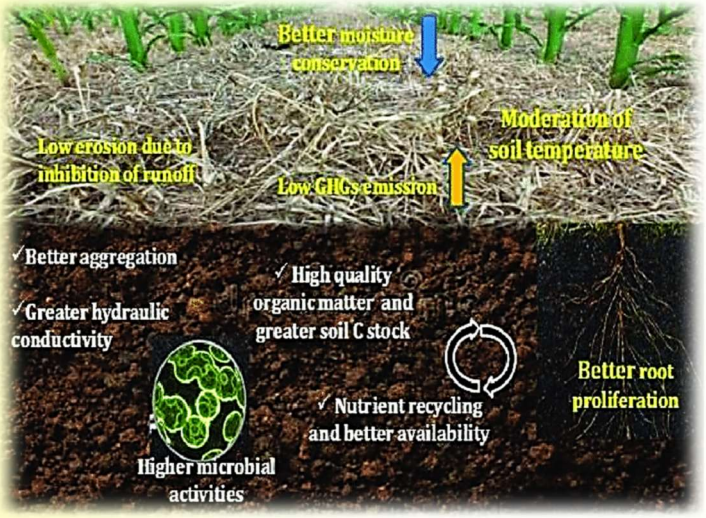
a) **PUSA Decomposer by ICAR**

The Indian Agriculture Research Institute has devised a radical solution for stubble burning in the form of a bio-enzyme called PUSA Decomposer. When sprayed, this enzyme decomposes the stubble in 20-25 days, turning it into manure, further improving the soil quality.

It leads to an increase in organic carbon and soil health while significantly reducing the fertilizer expense for the next cropping cycle. Being a sustainable agriculture practice, it also cuts back on the emission of greenhouse gases and prevents the release of toxins and soot into the air.

How to use:

The usual procedure is that these fungal species are provided in the form of a capsule. In the preparation procedure, four capsules are diluted in 25 L of water, which is enough to spray 1 hectare of land. It takes around 25 days to decompose the paddy straw and prepare the field for wheat sowing.



Benefits of decomposers:

1. Improves the fertility and productivity of the soil as the stubble works as manure and compost for the crops and lesser fertilizer consumption are required in the future.
2. Enhance Soil structure and enhance soil water use efficiency.

3. It is an efficient and effective, cheaper, doable and practical technique to stop stubble burning.
4. It is an eco-friendly and environmentally useful technology.
5. Accelerated composting is possible using composting culture.
6. Material Cost of on -site composting is nominal.

Further, it is evident that with regular use of waste decomposer in soil, there will be no requirement of waste decomposer in 4th or 5th year due to good built up of the microbial population. This will result in a natural ecosystem for organic waste management, zero waste farming where in all field waste will automatically get converted to organic manure.

Diversification can be a solution

Instead of paddy, farmers could grow nutritious, water-efficient crops such as maize, groundnut, and kharif pulses like moong, urad, and arhar.