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Crop Residue Management (Sustainable Solution)

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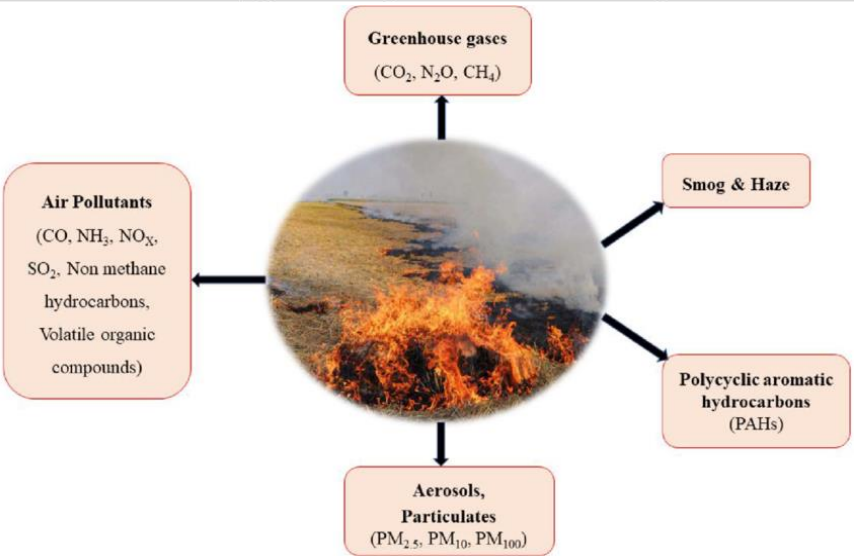
INTRODUCTION

As the Global population continuous growing, the demand for food increases and putting an additional pressure on agriculture system to produce more and more, is the major challenge to feed the population but now a days food security along with nutritive value is the critical issue, that everyone should have sufficient, quality and nutritious food. So there is need for 50% more grain in the coming years. keeping this, in the view more production of food grain is needed which directly or indirectly creating a pressure agriculture system to grow more on same piece of land year after year, so the soil become fatigue due to continuous depletion of nutrient from the soil to meet the demand of growing population. Continuously decrease in land holding per farmer, residue burning is the quick method is often used by farmers for land preparation and soil health is overlooked. The burning of crop residue is a major issue in Punjab and Haryana in rice wheat cropping system.

Residue burning leads to loss of 80% nitrogen, 25% phosphorus, 21% potash, 4.6 0% sulphur and around 70% CO2, 7% carbon monoxide, 0.6 % methane and 2.09% greenhouse gases emission leads to global warming along with destruction of beneficial micro-organism an earth and other health hazard.



Soil micro flora also effect the quality and quantity of production so to deal with this major problem, there is one solution and it also supported by the government sector also, that is "**In -situ crop Residue management"** with agriculture mechanization in field itself.

✓ **Positive impact of In-situ crop Residue management**

- ❖ Incorporation of crop residue in soil increase nutrient status enhances organic carbon in soil which make soil more fertile and productive with more carbon sequestration.
- ❖ Crop Residue can we use as mulch to prevent loss of moisture from field surface and also help to maintain soil temperature, increase water storage capacity due to more absorption by organic matter.
- ❖ Weed growth will suppress due to residue mulching and also reduce weed population.
- ❖ With the mechanization in agriculture such as harrow, cultivator, super seeder, rotavator, MB plough etc. the crop residue can easily incorporate in soil as well as it give the clean field as it attract the farmer perception and help in organic matter enhancing.
- ❖ Crop Residue is also used in industries for manufacturing useful product for day-to-day use.
- ❖ It is also used as animal feed during the dry season and available throughout year.
- ❖ Crop Residue are rich in NPK and other micronutrient which are needed by crop during its growth period. As the crop Residue in soil decompose slowly so that

nutrient requirement of crop will be meet throughout the growing period and also increasing carbon sequestration, maintain Soil PH, soil structure, Bulk density etc.

- ❖ Organic carbon is more in temperate region than tropical region due to more litter fall and its slow decomposition

✓ **Negative impact of crop Residue burning**

- ❖ Burning of crop residue destroy organic matter that could otherwise contribute to the soil organic carbon.
- ❖ Loss of essential nutrient like NPK.
- ❖ Due to this ill practice, leads to soil barren making more susceptible to erosion by wind and water .
- ❖ Also effect the soil PH by either acidification and alkalization of soil which can affect nutrient availability.
- ❖ More health hazards due to emission of gases by burning residue like CO_2 and carbon monoxide.
- ❖ GHG emission and global warming increases atmospheric temperature e.g. the temperature of Haryana reaches to 51^0 in 2024 in some district.
- ❖ Decline in soil fertility and productivity due to loss of beneficial soil flora, which help to break down organic matter content result in low water holding capacity, 60% of cropped area is rainfed as dependent on rainfall for growing seasonal crops.

✓ **Role of agriculture mechanization in crop residue management**

- ❖ The practice of burning crop residues can prevent by mechanization in agriculture otherwise which leasds to air pollution, green house gases emission and health issues. Incorporating residues into the soil help to enhances soil organic matter content, improve soil structure and promote microbial activity, reduces the need for synthetic fertilizers.

- ❖ **Straw Balers** collect and bundle crop residues, which is easy to manage, transport and storage and use for different purpose.
- ❖ **Choppers and Shredders** help to chop crop residues into smaller pieces, which can easily spread evenly across the field and act as a mulcher.
- ❖ **Happy seeder** use for direct sowing of seeds in field with standing residue mainly in rice -wheat cropping system without disturbing field.
- ❖ **Rotavators** help to mix crop residues into the soil, improving soil organic matter and nutrient cycling. By incorporating residues into the topsoil, rotavators help maintain soil fertility and structure.
- ❖ **Mulchers** spread crop residues across the field surface and help to conserves moisture, regulates soil temperature and suppresses weeds population.

- **Zero-till or Minimum-till machine** is used to plant crops directly into the field without removing crop residues, minimizing soil disturbance and allowing the residues to naturally decompose and enrich the soil.
- **Supper seeder** used to incorporate crop residue in soil and give the image of clean field and decomposed slowly and provide various benefits during crop growth period.

CONCLUSION

Crop residue management is a long-term support for sustainable agriculture. It helps farmers manage residues effectively while conserving soil, water, reducing environmental damage and improving the overall efficiency of field operations. Mechanized crop residue management contributes to resource conservation, improved physical, chemical and biological environment of soil enhances productivity, and environmental sustainability and many more