

Crop Residue: Management Option and Competing Use

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INTRODUCTION

Crop residues are important natural resources and their recycling is a major challenge. India is an agricultural country produces annually massive quantity of plant residues. Generally, residues are left portion of the plants after harvesting and threshing. They also called as waste materials that disposed but increasing realization of their importance, they are precious nature resources and not as waste products. Recycling of them into useful output/product is needed for meeting nutritional requirement of field crops. It helpful in maintaining physical, chemical and biological properties of soil and recovers ecological balance of the production system. A large percentage of residues are burnt by farmers to clear field after harvesting for timely sowing of succeeding crops. Labour shortage, high cost of its removal and mechanized harvesting of crops are central reasons for burning of crop residues. Crop residues burning causes pollution, health issues, declining soil fertility, and GHG emissions. Therefore, there is need of suitable management of crop residues in the field conditions. Conservation based system (CBS) of residue are more efficient than the conventional practices (CP).

Reasons behind on-farm burning of crop residues

Farmers know about the adverse effects of on-farm burning of residues. But, increased mechanization (combine harvesters), declining livestock's populations, long time period for composting and no alternative which is economical So, farmers had only option to burn the residues. The combine harvesters in the country particularly in IGP has increased from 2000 in year 1986 to over 10000 in year 2010. Punjab, Haryana and Uttar Pradesh of the IGP have about 75 percent area under combine harvesting. Major reasons for increase in the use of mechanized harvesting are high wages (harvesting season), labour shortage and uncertainty of weather. After using combine harvester, nearly about 80 percent of the residues are left in the field as loose straw which ends up by burnt on farm.

Burning on farm provides easy and fast way to clear the fields that requires for land preparation and sowing of succeeding crop.

The time gap in between rice harvesting and wheat crop sowing is only 15-20 days. Therefore, in this short time, farmers prefer to burn the all residue.

Competing uses of crop residues

1. Livestock feed
2. Compost making
3. Energy source
4. Bio-fuel production
5. Bio-methanation
6. Gasification
7. Biochar production

Crop residues management strategies/option

Indian agriculture is facing various challenges/problems viz; stagnating of net sown area, climate change effect, deterioration of land quality and reduction in per capita land availability. The Major reason for degradation of agricultural land is low soil C content. Management of crop residues with conservation agriculture (CA) is necessary for sustainability of our Indian agriculture. Hence, burning of residues need to reduce and utilized them in improving soil health and also reduce environmental pollution. Several technologies/expertise are available for proper use of crop residues in CA. There is need for large scale adoption by low-skilled farmers. Conservation agriculture is a viable option for crop residue management.

- Minimizing soil disturbance
- Seeding of crop seed directly into soil
- Enhancing organic matter cover on soil using cover crops
- Diversification of crops

CA-based resource conserving technologies are laser land leveler, zero tillage, DSR, crop diversification and raised bed planting. All technologies help in improve organic C, enhance input efficiency and reduce GHGs emissions. Sowing of a crop in the residues of preceding crop (rice) is a major problem which can solves by using turbo happy seeder (THS), for direct sowing of seeds in the residues. These machines are also helps in conserving nutrients and moisture,

controlling weeds and soil temperature regulation. Following point should keep in mind for management of crop residues.

1. Development of inventories of crop residue which area regional specific.
2. Satellite images collected for estimate the amount of residues burnt.
3. Assessment of the quality of crop residues and their suitability for off and on farm uses.
4. Developing simulation models for prediction of impact of conservation agriculture.
5. Enhancing rate of decomposition of residues for in-situ incorporation of residue.
6. Assessment of life-cycle of residue-based CA through comparing with conventional method of disposing residues
7. Optimizing residues use as source of fodder for livestock system
8. Assessment of residue retention/ incorporation suitability in different soil and climatic conditions.
9. Development of appropriate farm machine for collection, transportation and use of crop residues as mulch on soil surface.
10. Modifying combine harvester to chop, carries and deposit crop residues in the field during sowing.
11. Developing and implementing legislation on prevention and monitoring of on-farm crop residues burnings through punishment.
12. Developing the residues management policy for each state for its various uses.
13. Supplying machineries for CA on subsidy rates, promotes customer hiring services and loans for purchase of implements.
14. Introducing carbon credit schemes to benefit the farmers who follow CA for C sequestration and GHGs mitigation.
15. Add CA component in soil health card for best monitoring of crop residues burning and its effects on soil health.

16. Use crop residues as amendments and their use in agriculture like fertilizer or amendment.

17. Analyzing the socio-economic factor, benefit cost ratio, and technical feasibility of on and off farm residue uses.



1) Rice Residue Burning in the field



2) Sowing of wheat with Happy Seeder in Rice residue