

CROP RESIDUAL ISSUES AND MANAGEMENT IN INDIA

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ABSTRACT

Crop residue management means leaving last year's crop residue on the soil surface by limiting tillage. The management of crop residues affects carbon(C)-sequestration. It is also an important component of organic farming. It proper management helps reduction of soil erosion, sedimentation and pollution from dissolved sediment attached substances. This paper elucidates crop residue and its management

and the impact of a combined move by agriculture scientist and farmer.

Keywords : Crop residual, Air pollution, Waste Management, Clean India, Environment

INTRODUCTION

India is an agrarian economy. A vast majority of land is used for farming and a wide range of crops are cultivated in its different agro-ecological regions. The agriculture output generates a large quantity of agricultural wastes. This quantity of agricultural wastes will increase in future as with growing population there is a need to increase the productivity also. Agricultural residues are the biomass left in the field and these are of two types; field residues and process residues. Field residues are materials left in an agricultural field or orchard after the crop has been harvested. These residues include stalks and stubble (stems), leaves, and seed pods. The residue can be ploughed directly into the ground, or burned first. Good management of field residues can increase efficiency of irrigation and control of erosion. Process residues are materials left after the crop is processed into a usable resource. These residues include husks, seeds, bagasse, molasses and roots. These residues are used as animal feed, thatching for rural homes, residential cooking fuel and industrial fuel. However, a large portion of the crop residues is not utilized and left in the fields. The disposal of such a large amount of crop residues is a major challenge. A number of farmers in Punjab and Haryana follow exercise of burning crop residue, cited by environmentalists as one of the principal causes of dust haze and air pollution in Delhi and northern India. Due to the scarcity of alternative organic amendments, the retention of crop residue in fields can be considered key in promoting physical, chemical, and biological attributes of soil health in agricultural systems of developing countries.

CROP RESIDUAL TYPES AND GENERATION IN INDIA

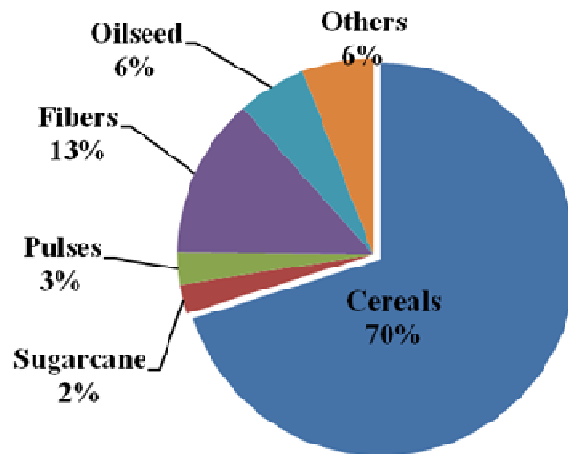
There are two types of agricultural crop residues. Field residues are materials left in an agricultural field or orchard after the crop has been harvested. These residues include stalks and stubble (stems), leaves, and seed pods. The residue can be ploughed directly into the ground, or burned first. Good management of field residues can increase efficiency of irrigation and control of erosion. Process residues are materials left after the crop is processed into a usable resource. These residues include husks, seeds, bagasse, molasses and roots.

The amount of crop residue generated was estimated as the product of crop production, residue to crop ratio and dry matter fraction in the crop biomass. The ratio of harvested product such as grain to above-ground crop biomass which is called harvest index, determines the amount of above-ground crop residues. The root: shoot ratio is one measure to help you assess the overall health of your plants. The root: shoot ratio determines the below-ground crop biomass. The total crop biomass generated by a crop equals the sum of the above-ground and below-ground biomass. The rooting system, root: shoot ratio and residue management ultimately determine the level of agricultural crop residue that can be left on the field to contribute to soil organic matter. The residue left on the field equals the total crop biomass minus the harvested products. The amount of total residue produced will vary from year to year depending on variations in inter alia weather, water availability, soil fertility and farming practices.

Ministry of New and Renewable Energy (MNRE 2009), Govt. of India estimated that about 500 Mt of crop residue is generated every year. There is a large variability in crop residues generation and their use depending on the cropping intensity, productivity and crops grown in different states of India. The residue generation is highest in Uttar Pradesh (60 Mt) followed by Punjab (51 Mt) and Maharashtra (46 Mt).

Graph 1 depicts the share of residues from various crops. According to MNRE Report 2009, among different crops, cereals generate 352 Mt residue followed by fibres (66 Mt), oilseed (29 Mt), pulses (13 Mt) and sugarcane (12 Mt). The cereal crops (rice, wheat, maize, millets) contribute 70% while rice crop alone contributes 34% of crop residues. Wheat ranks second with 22% of residues whereas fibre crops contribute 13% of residues generated from all crops. Among fibres, cotton generates maximum (53 Mt) with 11% of crop residues. Coconut ranks second among fibre crops with 12 Mt of residue generation. Sugarcane residues comprising tops and leaves generates 12 Mt i.e., 2% of crop residues in India.

Graph-1: Contribution of various crops in residue generation in India



Source: Crop Residue management report by IARI 2012-13.

UTILIZATION AND ECONOMIC VALUE OF CROP RESIDUAL IN INDIA

The crop residual has many uses and varies across different states of the country.

Crop residues uses	
Cereal	Cattle feed
Rice straw and husk	domestic fuel, Reseal to intermediaries
Sugarcane tops	dairy animals
groundnut	Fuelin brick kilns and lime kilns
cotton, chilli, pulses & oilseed	domestic fuel
sunflower	domestic fuel
coconut, stalks of rapeseed and mustard, pigeon pea and jute and mesta	domestic fuel

The uses of crop residues are:

Livestock, Compost Making, Energy source (biomass), Bio-fuel and bio-oil production

Bio-methanation- a non –destructive way to extract high quality fuel gas and produce manure, Biochar- is a fine-grained charcoal which can help in long term storage of carbon in the soil, gasification-crop residues can be used in gasifiers for generating ‘producer gas’.

The surplus residues i.e., total residues generated minus residues used for various purposes, are typically burnt onfarm. The estimated total amount of crop residues surplus in India is 91-141 Mt. Cereals and fibre crops contribute 58% and 23%, respectively (Fig. 2) and remaining 19% is from sugarcane, pulses, oilseeds and other crops. The crop residues contain both macro and micro nutrients, only values for the macro nutrients nitrogen, phosphorus, potassium and sulfur are economically significant.

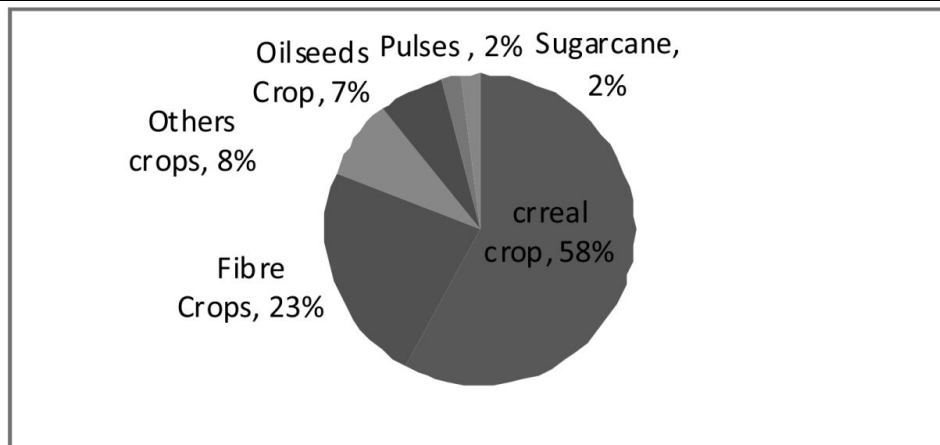


Fig 2: The share of unutilized residues in total residues generated by different crops in India

Source: calculated from MNRE, 2009

REASON AND CONSEQUENCES OF BURNING OF CROP RESIDUES

The increased mechanization, particularly the use of combine harvesters, declining numbers of livestock, long period required for composting and unavailability of alternative economically viable solutions, farmers are compelled to burn the residues. There are some other reasons also behind intentional burning of crop residues. These include clearing of fields, soil fertility enhancement, and pest and pasture management. On farm burning traditionally provides a fast way to clear the fields off the residual biomass, thus, facilitating land preparation and sowing/planting. It also provides a fast way of controlling weeds, insects and diseases, both by eliminating them directly or by altering their natural habitat.

The burning of crop residues leads to release of soot particles and smoke causing human and animal health problems. It also leads to emission of greenhouse gases namely carbon dioxide, methane and nitrous oxide, causing global warming and loss of plant nutrients like N, P, K and S. The burning of crop residues is wastage of valuable resources which could be a source of carbon, bio-active compounds, feed and energy for rural households and small industries. Heat generated from the burning of crop residues elevates soil temperature causing death of active beneficial microbial population, though the effect is temporary, as the microbes regenerate after a few days. Repeated burnings in a field, however, diminishes the microbial population permanently. The burning of crop residues immediately increases the exchangeable $\text{NH}_4^+ - \text{N}$ and bicarbonate-extractable P content, but there is no buildup of nutrients in the profile. Long-term burning reduces total N and C, and potentially mineralizable N in the upper soil layer.

NATIONAL POLICY OF MANAGEMENT OF CROP RESIDUE 2014

It was introduced in 2014 to deal with the issue of crop residues. The 2014 national policy envisages adoption of technical measures, including diversified uses of crop residue, capacity building and training along with formulation of suitable legislation, to deal with the issue of disposing of stubble. It also talks about extending central financial assistance for various interventions.

CASE STUDY AND SUCCESS STORY IN HARYANA

It is success story of a farmer Mahender Singh in Raseena village in Haryana. He is honored with national award for management of crop residual.

फसल अवशेष प्रबंधन कर जीता नेशनल अवार्ड

जागरण संवाददाता, करनाल : कहावत थी कि दबके बाह, रजके खा लेकिन आज मायने बदल चुके हैं। कभी ना बाह, मौज मना की कहावत आज के हालात पर सटीक बैठती है। यह कहना है रसीना गांव के प्रगतिशील किसान महेंद्र का। वर्ष 2008 से यह किसान फसलों के अवशेष का प्रबंधन कर आज सुखियों में है।

कृषि विशेषज्ञ डॉ. धर्मवीर, डॉ. अशोक व डॉ. अनिल खिप्पल के समझाने पर महेंद्र ने यह राह पकड़ी और सफल किसान बने। शुरुआत में फानों की खेत में जुताई की। इसके बाद हैप्पी सीडर मशीन आई तो उससे गेहूं की बिजाई करने लगे। आज किसान के पास खुद की मशीन है। भूमि की सेहत के ख्याल रखने वाले इस किसान को 2011-12 में आइसीआर ने नेशनल अवार्ड से नवाजा। राज्य स्तर पर तीन बार सम्मान मिला। मंगलवार को कृषि मंत्री ओमप्रकाश धनखड़ ने उसे सम्मानित किया। जिला स्तर पर महेंद्र कई बार अवार्ड जीत चुका है। वह भारतीय कृषि अनुसंधान परिषद का सदस्य भी है।

एक एकड़ से शुरुआत

कृषि विशेषज्ञों की सलाह के बाद शुरुआत में एक एकड़ के फाने नहीं जलाए। खेत में इतने केंचुए पैदा हो गए कि भूमि उपजाऊ बन गई। छह महीने के बाद मिट्टी चैक करवाई तो अच्छे नतीजे सामने आए। 2



जुंडला की अनाज मंडी में किसान महेंद्र सिंह को सम्मानित करते कृषि मंत्री ओमप्रकाश धनखड़ ● जागरण

उपलब्धि

- **बिना खाद और कीटनाशक के बासमती धान की ले रहे पैदावार**
- **अमृत जैविक ग्रुप के नाम से ग्रुप बनाकर बड़े शहरों में सप्लाय कर रहे सब्जियां**

से 2.5 क्विंटल की अधिक पैदावार भी हुई। इसके बाद महेंद्र के कदम नहीं रुके। अब बिना डीएपी व यूरिया के ही वह बासमती धान की फसल लेता है। हां पीआर में जरूर खाद डालना पड़ता है, लेकिन

वह भी बेहद कम। अब महेंद्र के फार्म पर ढाई एकड़ में डेमो चल रहा है। इस जमीन की जुताई के बिना ही फसल ली जा रही है।

दिल्ली व चंडीगढ़ सप्लाय करते

महेंद्र ने अमृत जैविक ग्रुप के नाम से आर्गेनिक फार्मिंग ग्रुप बना रखा है। 30 किसान इसमें शामिल हैं। कैथल के साथ ही करनाल व कुरुक्षेत्र के किसान भी इससे जुड़े हैं। इस ग्रुप के किसानों की सब्जियों की सप्लाय गुडगांव, दिल्ली, चंडीगढ़ व पटियाला के मॉल में होती है।

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