Waste and Residue Management in the Indo-Gangetic Plains

The Farmer’s Perspective

Introduction

Punjab is also known as the grain bowl of India contributing about 29 per cent rice and 46 per cent wheat to the central food grain pool. This assumes significance in view of the fact the Punjab comprises of only about 1.5 per cent of India’s land surface but owing to fertile soils, hardworking farmers, adoption of modern agricultural techniques, the state is at the forefront of agricultural production in the country. The total net sown area of the Punjab state is 4.13 million hectares.

There are two major crop growing seasons in Punjab namely Kharif/Summer (May to September) and Rabi/Winter (November to April). In Rabi season, wheat is grown while in the Kharif season rice is transplanted. Before the sowing of respective crop, the fields are cleared of the standing stubble or stalks by generally putting them on fire and this practise is known as open agricultural burning. This practise of putting the crop residue on fire is widely followed in the northern parts (Indo-Gangetic Plain) such as Punjab, Haryana, Rajasthan and Uttar Pradesh because it is a very easy, quick and cheap option to clear and prepare the field for the next crop. The area under paddy in Punjab, Haryana, Rajasthan and Uttar Pradesh is around 3.0, 1.3, 5.8 and 0.18 million ha, respectively. These four states on an average produce around 37-39 million tonnes of rice residue. However, the states of Punjab & Haryana alone account for around 28-29 million tonnes of rice residue, majority of which (around 80%) is burnt in the open.

In the case of wheat straw, about 85% wheat straw is managed with the straw making machine and rest 15% is burnt in the fields. But that 15% is spread over in the 80% of wheat area. This practice of open burning of wheat straw was followed in abundance till two years ago but now the ground situation has somewhat improved.

Dominant crop cycle systems in Punjab, India

The wheat-rice is the major cropping system in the state, with the area under rice in Punjab being around 3.0 million hectares and under wheat approximately 3.5 million hectares. The increased mechanized operation of harvesting of wheat and rice using combine harvester has resulted in a generation of colossal amount of crop residue, which is very tough to manage. The combine harvester cuts the crop from few inches above the ground and leaves a lot of residue in the field.

Who burns what and why?

A large proportion of the crop residue burnt is the residue generated by harvesting of wheat and rice and the problem exacerbates in the case of rice residue burning as it forms thick smog and affects the states in the vicinity in the winter season.

The rice straw is burnt because there is a very narrow window (approx. 20 days) between the harvesting of rice crop and sowing of wheat crop and open burning is perceived to be the easiest, quickest and cheapest way of clearing the fields to make these ready for the next
crop. However, this problem is continuing unabated in the state because the majority of the farmers are unaware about the ill-effects of open agricultural burning due to the lack of information, awareness and understanding. Also, lack of stubble management machinery and equipment due to its cost factor and limited use is another major factor for majority of the farmers’ practicing open agricultural burning.

The wheat stalks which are left in the field after the wheat straw is prepared with the ‘wheat straw making machine’ after harvesting the wheat crop are burnt because it is the farmers’ apprehension that the wheat stalks interfere with the transplantation of rice crop, where the wheat stalks in the field hinder in the manual transplantation of rice and more so in the initial stage of the rice crop, these stalks floats on water and get accumulated in a certain corner of the rice plot due to the winds and do not let the rice crop grow properly in that area.

What are the impacts of open burning in India?

Open burning in India affects one and all. It affects the soil, human and animal health, besides causing severe harm to environment, biodiversity (flora and fauna) and hindering traffic movement both on land and in air leading to accidents and delaying the air traffic. Soil loses many essential nutrients such as Nitrogen, Phosphorous, Potash, Sulphur, Organic carbon, while humans and animals have serious health issues which translate into increased medical expenditure. The biggest casualty in this is the environment, as the quantity of gases (CH₄, NO, SO₂, CO and CO₂) released contributes immensely to the global warming and black carbon affects the glaciers which in turn destabilizes the weather pattern in the region and aggravates the climate change. Also, some rare and useful species of birds, insects and plants is lost due to open agricultural burning.

Isn’t open burning banned?

Open Agricultural Burning is banned in India vide the orders of National Green Tribunal (NGT) and of the Pollution Control Board of the respective states. According to the guidelines of NGT, if caught burning agricultural residue in the open, farmers owning less than 2 acres of land will be fined INR 2,500, those owning between 2-5 acres of land will be fined INR 5,000 and those owning above 5 acres of land will be fined INR 15,000. Also, the states have directed to withdraw any form of relief or assistance given to the farmers who indulge in crop residue burning.

What are some alternatives to open burning?

The alternatives to open agricultural burning of crop residue in the state can be broadly categorized in to two options viz. in-situ and ex-situ management. In-situ management would be to plough the residue back in to the soil, there by using the straw as a manure and soil enricher as the residue contains both micro and macro nutrients. In-situ management is also what is promoted by Conservation Agriculture (CA) where the crop residue is used to enhance the soil fertility, enhance production and yield of crops, provide resilience to biotic and abiotic stress, control soil erosion and increase the water retention properties of the soil.

The in-situ management of paddy straw can be done with help of the machines like happy seeder, rotavator, paddy straw cutter cum spreader, mould-board plough, chopper/mulcher and zero-till-drill etc. While, the wheat straw management is easier because wheat straw has
high end value and collected with machine and used as fodder for animals. Left over wheat root stalks can be managed simply with planker, tilling the field with disc harrow/rotavator/mould-board plough etc. Also after applying a light irrigation to the harvested wheat field, summer moong/green manuring crops and maize fodder can be directly sown with the Happy Seeder in the standing wheat straw/stalks.

Ex-situ management is to collect the crop residue from the field and use it as fuel in bio-mass based power generation plant/bio-gas units to produce electricity. The rice straw is also used as bedding material for animals, as fuel in brick kilns, as fodder for animals, for making card boards and papers and it could also be used in bio-char making. Also, the government is planning to extract bio-ethanol from the rice straw and also convert it to bio-CNG and use it as fuel in vehicles and as bio-manure in the fields. In addition to the above techniques, some more innovations like pellets and briquettes making from the rice straw are also in the pipeline.