

EFFICIENT EXTENSION STRATEGIES FOR CROP RESIDUE MANAGEMENT IN NORTH INDIA

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I Introduction

The rice-wheat system (RWS) is the most prevailing production system in North-Western states of Punjab, Haryana and western Uttar Pradesh and recognized as heartlands of Green Revolution and provides bulk of rice and wheat in the national food basket. About 34 million tonnes of rice residues in this region of which Punjab alone contributes about 65 per cent. With progressive increase in mechanized harvesting of rice and wheat crops coupled with growing labour shortages, crop residue burning has become a serious problem and causes phenomenon environmental pollution. Estimates indicate that up to 80 per cent rice residues are burnt by farmers in Punjab. It is estimated that in NW states of India about 23 million tonnes rice residues are burnt annually. Burning crop residue caused phenomenal pollution problems in the atmosphere and huge nutritional loss and physical health deterioration to the soil.

With the increase of production of crops (cereal and others), crop residues are found to be increased. Of late, this increasing trend of crop residues is assumed to be an important issue of farm management in India. The generation of crop residues is highest in Uttar Pradesh (60 mt) followed by Punjab (51 mt) and Maharashtra (46 mt) (Anonymous, 2013). In India, more than 275 million tonnes of paddy straws are generated annually (Anonymous, 2014; Veena and Pandey, 2011). Estimated total crop residues unutilized in India are 84-141 mtyr^{-1} , where cereals and fiber crops contribute 58 per cent and 23 per cent, respectively. Out of 82 mt towards surplus crop residues from the cereal crops, 44 mt are obtained from rice crop which are mostly burnt at the farm itself (Derpsch and Friedrich, 2010). Nearly 30 million tonne of paddy straw are generated in Punjab and Haryana. About 7 million tonnes (from 0.8 million ha) is removed from the field for alternate uses like power generation, biofuel, feeding animals and for heat generation etc. and about 23 million tonnes of paddy straw (from 2.8 million ha) is burnt in the field as an easy and quick method of disposal.

Burning of 23 million tonnes of rice residues in NW India leads to a loss of about 9.2 million tonnes of C equivalent (CO_2 -equivalent of about 34 million tonnes) per year and a loss of about 1.4×10^5 t of N (equivalent to Rs 200 crores) annually. It is estimated that one tonne rice residue on burning releases 13 kg particulate matter, 60 kg CO, 1460 kg CO_2 , 3.5 kg NO_x , 0.2 kg SO_2 . Thus, burning of straw causes phenomenal pollution problems in the atmosphere and huge nutritional loss and physical health deterioration to the soil.

II Technological and Social Aspects of Crop Residue Burning

Burning of paddy residues is environmentally unsafe as it leads to release of soot particles and smoke causing problems of human health and emission of greenhouse gases (McCarty, 2011, Gupta *et al.*, 2004; Jain *et al.*, 2014) that add to global warming and climate change. It also results in loss of plant nutrients such as Nitrogen (N), Phosphorous (P), Potassium (K), Sulphur (S) and carbon which are assumed to be very important for maintaining soil health. If the crop residues are incorporated or retained, the soil will be enriched, particularly with organic carbon and nitrogen. Heat from burning residues elevates soil temperature causing death of bacterial and fungal population. From the farmers' point of view, burning may be seen as the most suitable method of disposing of paddy straw (Anonymous, 2004). It is not only a cost-effective method but it acts as an effective pest control procedure.

Paddy growers routinely burn their paddy straw to dispose off the straw for sanitation and seedbed preparation purposes, inconveniences faced in the use of farm machinery for preparing the post-rice wheat field and because of the short turn-around time between the harvesting of paddy and the sowing of

Rural youth should be encouraged to start Custom hiring Centre as START UP and should suitable supported through financing. Youth should be encouraged to start their own machinery club so that the problem can be sorted out at village level. Similarly, pesticide spraying can emerge as potential area of entrepreneurship development. The village panchayat which are doing excellent work should be honoured with cash price (incentivization) so that the money can be utilized for the welfare of villages.

Regular programme on Residue Management should be telecasted on DD Kisan, Doordarshan and local DD Channel during harvesting season so that continuous awareness is necessary to sensitize the farmers. Since seeding of wheat with happy seeder require tractor of high power (more than 45 HP), arrangements should be made to motivate such farmers who own such tractor and their name should be listed for custom hiring for happy seeder. KVKs should make an integrated approach for reaching the last mile farmers through F2FE and tools of ICT. Such efforts should be made well in advance before the season commences. Similarly, training to machine operators, custom hiring owners, field man, service providers should be imparted in the month of September and October so that they can be well versed with the technology without wasting time.

A special package amounting one crore rupees as a special grant out of scheme "In-situ management of residue" announced by central Government should be allotted to each KVK for training, mass mobilization and demonstrations. In this budget, each KVK should also be given seven happy seeder so that each KVK can demonstrate at strategic locations in 5-7 villages. The proverb "Charity begins at home" should be implemented and all the public representatives like Chairman of Block, Zila Parishad, MLA, MP and other public representatives should come forward and work in their respective villages and declare them zero burning villages.

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